*Journal of Applied Engineering and Technological Science*
Vol 7(2) 2026: 1449-1465

# *MACHINE LEARNING FOR PUBLIC SECTOR PERFORMANCE PREDICTION: THE ROLE OF COMMUNICATION, DECISION-MAKING, AND STRATEGY ALIGNMENT*

**Aris Riyadi[1*], Engkus Kuswarno[2], Dadang Sugiana[3], Asep Suryana[4]**
Padjadjaran University, Indonesia[1,2,3,4]
aris22003@mail.unpad.ac.id[1*], kuswarno@unpad.ac.id[2], dadang.sugiana@unpad.ac.id[3], a.suryana@unpad.ac.id[4]

Received: 16 November 2025, Revised: 22 January 2026, Accepted: 25 January 2026
**Corresponding Author*

***ABSTRACT***
*This study explores the relationship between communication quality, participatory decision-making, and organizational performance in the public sector using machine learning techniques. Data were collected from government agencies, employing stratified random sampling to survey civil servants at various levels of tenure. A decision-tree classification model was used to identify key predictors of organizational performance, with the model achieving 71% accuracy and a weighted F1-score of 0.71. The results highlight that interpersonal communication quality, employee involvement in decision-making, and strategic alignment were the most significant factors influencing performance. This study demonstrates the value of machine learning in capturing complex, nonlinear relationships in organizational data and provides practical insights for enhancing communication systems and decision-making structures in public institutions. The findings offer a framework for improving public sector performance by promoting participatory governance and aligning strategic priorities.*
***Keywords:*** *Organizational Performance, Decision Making, Communication Quality, Machine Learning, Public Sector*

## 1. Introduction

Research conducted in management and communication fields shows that workplace communication stands as the vital organizational element which determines business success according to studies about organizational effectiveness. The ability to communicate effectively between people leads to better teamwork and trust development and problem-solving skills which results in improved employee coordination and decreased workplace disputes (Singh, A. K., 2014; Gunathilaka & Wijeratne, 2022). Organizations which maintain open communication channels will achieve better employee involvement and develop a single workplace culture that enables teams to work together for common objectives (Vijayakumar, V. S. R., and Padma, R. N., 2014). Public institutions need these particular characteristics because their performance evaluation depends on their ability to provide services efficiently while keeping their service quality at a high level for their citizens. Organizations base their strategic foundation on communication to achieve operational adaptability while sustaining productivity and institutional stability in their complex dynamic environments.

Decision-making serves as the fundamental operational component which enables organizations to reach their success goals. Active employee participation in decision-making increases ownership, accountability, and motivation to achieve organizational goals. Research shows that higher employee participation leads to better organizational outcomes and individual development, which strengthens overall institutional performance (Kim, J. S., 2022; Kalua et al., 2026; Sanjaya et al., 2026). Furthermore, organizations that employ data-driven decision support systems are better able to improve decision quality, strategic coordination, and organizational responsiveness by integrating analytical insights into managerial processes (Lu, M., 2025). Organizations require communication systems and decision-making frameworks to operate as a unit because these systems enable their teams to work together and support creative work. The systems theory which Katz and Kahn (2015) developed supports this view because it shows organizations function as social networks which need communication to connect members with their positions for achieving organizational success. Public sector organizations require their

communication systems to operate as part of their decision-making processes because they need both governance participation and performance monitoring to achieve accountability and defend public trust and address public administration issues.

Research about organizational decision processes and communication systems has delivered important findings but most studies continue to use regression and structural equation modeling (SEM) for their linear relationship identification. The research methods function well for particular studies yet they fail to detect intricate non-linear organizational patterns which appear in public sector organizations (Blockeel et al., 2023; Chaabane, S., Guermazi, S., and Hammami, M., 2019). The current research faces a major drawback because it studies public sector organizations through methods which were developed for private businesses and typical organizational environments. The current machine learning environment has not established sufficient recognition for decision-tree models which use modern implementation methods. Machine learning technology allows public sector organizations to study intricate non-linear connections which reveal detailed organizational performance relationships between communication and decision-making activities (Putra et al., 2026).

Public organizations encounter specific organizational barriers which include political monitoring and funding limitations and organizational layers that create complex relationships between communication efforts and decision processes and performance results. The current traditional methods which examine linear relationships between independent variables do not effectively handle the intricate relationships between these variables. The decision-tree models achieve better results because they evaluate all relevant variables at once which results in improved performance factor identification. Machine learning technology shows promise for public sector work but organizations choose to stick with their established models instead of adopting this innovative solution. Public organizations increasingly face governance and service delivery complexities that require more sophisticated analytical approaches. Machine learning techniques, particularly decision-tree models, have demonstrated considerable potential for improving public-sector performance analysis and decision support (Saxena, 2023; AL-Inizi, 2025; Kang et al., 2021; Raj & Gopalan, 2025; Lokeshwaran et al., 2025).

Research about organizational communication and decision-making processes has produced many studies but scientists have not yet developed machine learning models which use decision-tree models to forecast public sector performance. Public institutions operate under different rules than private organizations because they must deal with political supervision and restricted funding and their organizational complexity which impacts their communication systems and decision-making systems. The existing factors between communication and decision-making and performance create non-linear connections which standard analytical approaches including regression and SEM fail to detect. The traditional methods which study linear relationships have proven useful but they fail to explain the intricate public sector organizational systems. Decision-tree models in machine learning provide researchers with a successful solution because they allow them to analyze multiple factors simultaneously which reveals intricate patterns that traditional analytical methods fail to identify. Public sector organizations find decision trees suitable because these models enable them to handle multiple performance influencers which include communication quality and decision-making involvement and strategic alignment (Saxena, N. C., 2023). The research investigates how different factors work together to boost public sector performance through machine learning methods which reveal new insights about organizational behavior variables and their impact on performance results.

The field of data science together with machine learning has produced new analytical approaches which solve problems that standard research approaches cannot handle. The non-linear non-parametric relationship analysis of machine learning decision-tree models helps researchers identify complex data patterns in big datasets without requiring knowledge about data distribution or variable influence (Park et al., 2021; Shafie et al., 2024). The models serve as essential analytical tools which enable researchers to analyze public sector organizational behavior through their examination of communication excellence and staff involvement and strategic direction effects on operational performance. The research by Park et al. (2021) and Yang et al. (2021) shows that decision-tree models produce precise health outcome predictions

which benefit public health organizations. The research by Shafie et al. (2024). and Yang et al. (2021) shows that decision-tree models produce successful health outcome predictions which benefit public health organizations. It applied machine learning to create predictive models which estimated organizational performance in government agencies. Machine learning shows increasing potential for public sector use but the public sector continues to use traditional models which fail to understand performance system complexities. The research uses decision-tree models to analyze these relationships because it wants to determine how public sector performance relates to communication and decision-making and strategic alignment.

The research aims to identify vital factors which lead to public servant performance decline by using decision tree machine learning models. The research establishes an integrated analytical framework which analyzes government organization data to study three essential variables which include interpersonal communication quality and employee decision-making involvement and strategic organizational alignment. The research evaluates performance effects by analyzing independent and combined variables to demonstrate their effects on results while exposing performance problems which standard regression models fail to detect. The research uses machine-learning decision-tree modeling to discover intricate non-linear patterns which standard analytical techniques fail to detect (Johnson, J. M., and Khoshgoftaar, T. M., 2019). The research investigates the following particular questions which need answers.

1. Public servants achieve their best results through three vital elements which consist of their communication abilities and their participation in decision-making and their capacity to maintain strategic direction.
2. What non-linear relationships exist between these variables which lead to poor public sector organization performance?
3. Machine learning decision-tree models achieve better system behavior prediction than traditional methods because they generate more accurate predictions.

The research examines organizational elements to discover their mutual effects which produce hidden relationships that influence public sector performance results.

The research data from this study helps researchers understand public sector organizational performance better because it studies communication and decision-making systems through actual data evaluation. The research uses machine-learning decision-tree modeling to analyze different predictors which reveal complex relationships that standard analytical methods cannot detect. The research provides essential information to public administrators and policymakers through its identification of performance predictors which exist at different organizational levels. The research results will help organizations create improved communication systems which enable them to make better decisions for achieving superior strategic alignment between their organizational units. The research unites theoretical knowledge with data-based methods to develop a complete framework which enables public organizations to boost their operational performance and service delivery quality.

## 2. Theoretical Framework

### *2.1 Organizational Performance*

The research used an extensive method to assess both organizational communication and performance levels. The research employed the Organizational Communication Maturity (OCM) scale together with additional instruments which drew their basis from McPhee and Zaug (2000) and the Balanced Scorecard (Kaplan and Norton, 1996). The five organizational communication and performance measurement specialists evaluated the instruments to achieve construct validity. The assessment items underwent review to verify their ability in measuring the research variables which included communication quality and decision-making involvement and strategic alignment. The researchers assessed construct reliability through Cronbach's alpha which produced results above 0.80 for all constructs (Farhadpour, S., Warner, T. A., and Maxwell, A. E., 2024). These steps ensure that the measurement instruments used in this study are both valid and reliable.

Organizations achieve better performance through their use of participatory decision-making processes. The contingency theory which Fiedler introduced in 1964 demonstrates that

leaders achieve better results through method selection based on the particular situations they encounter. Decision-making participation from employees creates ownership and accountability which results in better performance and increased employee involvement (Vijayakumar and Padma, 2014). The success of an organization depends on employee participation in decision-making because it creates worker motivation which leads to team unity that produces better performance results. The decision-making process functions as a connecting element which links communication to performance results while simultaneously influencing the decision-making process effectiveness and organizational achievement.

Research about organizational communication and decision-making and performance in the private sector sector does not apply to the public sector because its operational environment is distinct. Public organizations encounter three main challenges because of political oversight and restricted funding and citizen monitoring which produce separate organizational choice systems and communication networks than those found in private sector organizations (Sulistiani et al., 2024). The public sector uses its official communication channels to execute decisions about service delivery and policy execution because it needs to stay transparent and meet regulatory requirements (Mykkänen, 2023). The existing private-sector models need modifications to understand all aspects of public sector operations and decision-making behaviors.

The research uses predictive quantitative design to study public sector institution performance enhancement by applying machine learning to their communication systems and decision processes and strategic planning methods. The analysis of organizational behavior using traditional statistical methods such as regression and SEM faces limitations because these methods cannot identify complex non-linear relationships which exist in organizational data. The decision-tree classification model received selection because it operates effectively with complex non-linear data patterns which do not require distribution assumptions (AL-Inizi, M. S. M., 2025). The model produces its best results when used by public sector organizations because their performance depends on various interconnected elements. The research employs machine learning to identify concealed relationships which standard modeling approaches fail to identify which will result in better knowledge about public sector performance determinants.

*2.2 Decision-Making and Organizational Effectiveness*

The relationship between communication and decision-making and strategic alignment and organizational performance exists as a complicated system which connects all these elements. The theoretical foundations enable us to develop a conceptual framework which shows how communication affects decision-making operations and strategic alignment which subsequently affect organizational performance. Decision-making depends on communication as its main factor which helps organizations achieve their strategic objectives through clear decision-making processes. As strategic alignment ensures that the organization's internal practices are in line with its external environment, it acts as a moderator that strengthens the effect of communication and decision-making on performance. Organizations will reach their highest performance level through purposeful actions which create open communication paths and let team members join decision-making processes while keeping their strategic path intact (Ghonim, M. A., et al., 2022).

The research applies decision-tree models based on multiple organizational theories which establish a strong theoretical base for forecasting public sector performance. The Systems Theory (Katz and Kahn, 2015) presents organizations as intricate systems which need proper communication to connect people with their organizational objectives. The decision tree demonstrates this concept through its use of communication quality as a primary predictor because it enables organizations to perform their processes effectively. The decision tree uses employee participation and decision-making involvement as features which Fiedler's Contingency Theory (1964) shows affect decision-making results by connecting to leadership approaches and organizational settings. Mintzberg's Organizational Structure Theory (1993) shows that organizations must create structures which support their strategic goals through the decision tree model which demands strategic alignment to achieve organizational success. The 1985 Competitive Strategy Model by Porter shows that organizations need strategic alignment to

succeed which the decision tree evaluates through its assessment of how alignment impacts both decision-making operations and operational performance. The decision tree applies Grice's Communication Theory to study organizational communication clarity and purpose for performance prediction through its communication-related features. The theoretical models serve two purposes by helping identify important features and establishing the decision-tree algorithm as a suitable method for public sector performance prediction through their explanation of communication and decision-making and strategy alignment connections.

*2.3 Organizational Performance Prediction Models*

Organizations use advanced machine learning and data analytics methods to build sophisticated predictive models which help them predict their future organizational performance. Decision trees function as widely used analytical tools because they analyze large datasets to determine which business factors lead to organizational success (Shannon, C. E., 1948; Fiedler, F. E., 1964). Decision trees evaluate organizational performance by examining three critical elements which consist of interpersonal communication and leadership style and strategic alignment. Decision trees select attributes for prediction through entropy-based splitting which identifies the most informative features that lead to class separation. The method delivers successful results when organizations maintain unbalanced data distribution because it enables models to identify vital factors which separate successful organizations from underperforming ones. The research by Kang et al. (2021) demonstrate that decision trees operating in public health agencies of the public sector help organizations find essential performance indicators which determine their success. The decision tree method used for performance prediction encounters two primary challenges which Chaabane S. and his co-authors Guermazi S. and Hammami M. (2019) identified. The models develop overfitting problems while simultaneously showing preference for dominant classes. The models require improvement through pruning and cross-validation techniques to achieve better stability and generalization for different organizational settings.

The research develops a conceptual framework which examines how communication systems affect decision processes which then impact public sector organizational performance. The framework demonstrates that communication quality levels affect employee decision-making participation which subsequently affects organizational performance. The quality of communication leads to better teamwork which results in improved decision-making abilities. The research predicts that organizations which involve their staff members in decision-making processes will achieve superior performance results. The relationship between communication and decision-making effectiveness receives influence from organizational culture together with leadership approaches which either support or block the success of these processes.

## 3. Materials and Method

*3. 1 Data Collection*

The survey used a five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"), to collect responses. The study required participants to answer questions about their demographic characteristics which included their gender and educational background and their age and professional experience. The survey received responses from all 150 participants who worked at the government information management agency which resulted in a 100% response rate. The survey instrument contained 15 items which McPhee and Zaug (2000) applied to measure employee interaction components and their organizational structure impacts through employee communication. The Organizational Communication Maturity Model by Johansson et al. (2019) formed the basis for 7 key theoretical domains, including communication understanding, function, prerequisites, competencies, and practices. The Theory of Human Resource (Bernardin and Russell, 1993) shows how employee management systems affect performance results according to this framework. The Balanced Scorecard (Kaplan and Norton, 1996) unites financial performance metrics with non-financial performance indicators. Furthermore, The research by Severgnini et al., (2018) about the Stakeholder Prism Theory

demonstrates that organizations need to evaluate stakeholder contentment and corporate social duties together with their monetary performance indicators.

The instrument received content validity through evaluation by 5 experts who also helped the researchers calculate Cronbach's alpha for each construct. The Organizational Communication Maturity (OCM) scale achieved high reliability because its Cronbach's alpha value reached 0.89. The research team used Confirmatory Factor Analysis (CFA) to evaluate construct validity which produced acceptable fit indices (CFI = 0.95, RMSEA = 0.06). The research evaluated 34 different variables through PI9 as their dependent measure to measure public sector institutions' service delivery performance.

The research examined civil servants who work at a government information management agency because these organizations serve as vital public sector institutions. Proportionate stratified random sampling was employed to ensure that 17 organizational units were adequately represented in the sample. The organization used its internal communication system to distribute invitations which selected participants who represented various career levels. The research included only staff members who had worked at the agency for two years or longer because they needed to demonstrate their understanding of agency operations. The research involved 150 participants who all responded to the survey which achieved a 100% response rate. All participants needed to confirm their current work position and work duration to establish their proper study participation. The survey platform operated with security features which maintained participant identity protection from start to finish of the survey process. The participants received written informed consent forms which explained their right to confidentiality before beginning the research study.

*3. 2 Measurements*

The research used Decision Tree Classification to forecast organizational performance (PI9) through an analysis of employee interaction data and communication maturity and organizational management variables. The data existed in an Excel file which needed categorical column conversion to numeric data types for machine learning model compatibility. The data preprocessing required mean value substitution for missing continuous data points and mode value substitution for missing categorical data points. The data set received an 80/20 split for training and testing purposes while maintaining class distribution through stratified sampling. The model underwent 10-fold cross-validation to assess its performance while avoiding overfitting and demonstrating its ability to analyze various data sets.

The Decision Tree Classifier achieved successful results in both classification and regression tasks because it used entropy-based splitting to maximize information gain. The tree's depth limit was established at 5 to stop the model from overfitting while maintaining its ability to predict new data points. The model received its training data from 80% of the available information which we used to evaluate its performance through precision and recall metrics and F1-score and confusion matrix analysis for both prediction accuracy and class distribution assessment. The Decision Tree model received selection over Random Forest and Support Vector Machines (SVM) because it provides interpretable results which demonstrate which organizational elements affect performance. Random Forest produces superior prediction accuracy but its intricate decision-making system prevents public sector organizations from implementing this model. The SVM models demonstrated strong performance but their implementation process involved extensive data preparation work and model parameter adjustment which did not suit the characteristics of this dataset. The feature importance calculation showed which variables caused the most significant changes in the performance results. The decision tree visualization together with the top 17 features provided better insights about how variables interact with each other and what factors the model uses for its predictions.

## 4. Results

The survey results indicate women comprise 61% of participants but men account for 39% of all participants. The participants reached high educational achievement because 69% of them received bachelor's degrees and 19% earned master's degrees and 12% finished diploma programs

and 1% completed secondary education. The educational data shows higher achievement rates than what exists at the national level. The workforce shows diverse experience levels because 28% of workers have 2-5 years of experience and 28% have 6-10 years of experience and the remaining workers have different amounts of work experience. The staff members have worked at the organization for less than two years (13%) and more than fifteen years (23%). The organization benefits from having both new and experienced staff members because veteran employees teach newer employees while the newer employees introduce innovative approaches to enhance teamwork and organizational success.

*4.1 Decision Tree Classification*

The decision tree model for PI9 (service impact on society) classification reveals essential knowledge about how features affect the classification results. The root node of the tree uses SS2 (interpersonal communication quality) values below 4.5 to make a crucial decision because it shows 1.42 entropy which indicates high uncertainty at this point. The dataset separates into two main branches after the initial split based on PI10 (achievement of quality targets) values below 4.5 and MN3 (decision-making involvement) values below 3.5. The model improves its predictions through successive splits which use PI10 (achievement of quality targets) and MN3 (decision-making involvement) as key features to create a distinct data separation. The model distributes its samples mainly between classes 4 and 5 because these features reduce uncertainty while improving prediction accuracy. The tree structure shows decreasing entropy values at each split which indicates these essential features drive the classification process with strong confidence.

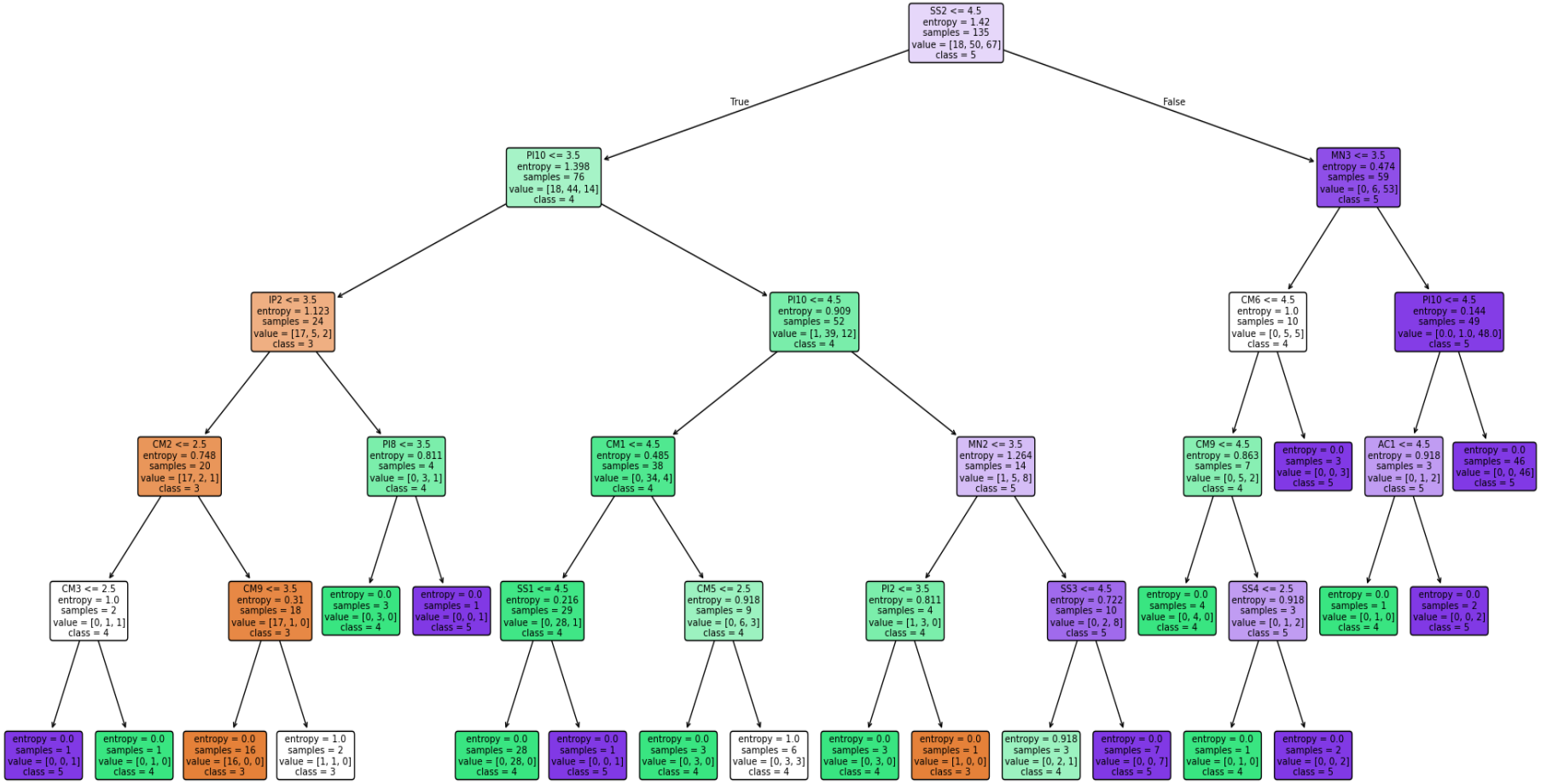


Fig. 1. The GUIDE Classification Tree Model of Organizational Performance.

Note. MN: Membership Negotiation; SS: Self Structuring; AC: Activity Coordination; IP: Institutional Positioning; CM: Communication Maturity; PI: Performance Indicator

*4.2 Importance GUIDE*

The GUIDE classification tree feature importance plot shows how particular features drive the decision-making process through its structured design. The plot shows SS2 (interpersonal communication quality) as the most important feature with a score of 0.33 followed by PI10 (achievement of quality targets) at 0.19 and MN3 (decision-making involvement) at 0.13. The three variables serve as the main factors for classification because they produce most of the predictive power in the model. The model uses SS2 (interpersonal communication quality) and PI10 (achievement of quality targets) and MN3 (decision-making involvement) as its primary features because they have importance scores of 0.33 and 0.19 and 0.13 respectively. The model uses a limited number of features for prediction because PI2 (achievement of quality targets) and CM9 (internal miscommunication handling) have importance scores of 0.04 and 0.03 respectively. The model distributes its decision-making power across only a few essential predictors while ignoring less important features. The model distributes its decision-making power across only a few essential predictors while ignoring less important features.

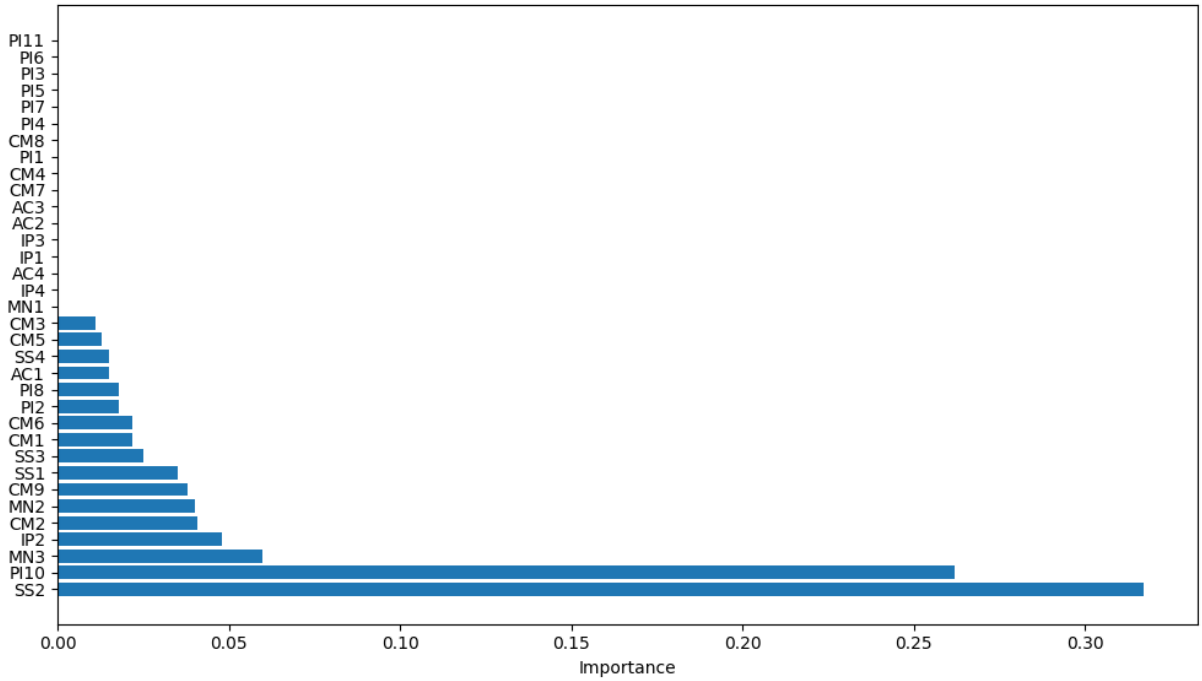


Fig. 2. Top 17 important predictor variable with importance scores in the classification models of PI.
Note. MN: Membership Negotiation; SS: Self Structuring; AC: Activity Coordination; IP: Institutional Positioning; CM: Communication Maturity; PI: Performance Indicator

The decision tree structure combined with feature importance analysis enables researchers to understand the complete operation of the model. The decision tree and feature importance ranking show that SS2 (interpersonal communication quality) and PI10 (achievement of quality targets) and MN3 (decision-making involvement) are the most important factors for classification. The decision tree model achieves well-defined and accurate class assignments because it produces low entropy values at its terminal nodes. The decision tree model achieves high efficiency through its ability to select vital features for prediction while all other variables prove to be non-essential. The research shows that the decision tree model depends on vital features for accurate predictions but other variables do not affect the results. The research results will help future model development and enable the study of new feature connections in future investigations.

## 5. Discussion

*5.1 Model Performance Evaluation and Classification*

Organizations achieve their best performance through effective communication and employee participation in decision-making because these practices establish environments which

drive staff involvement and simultaneously boost employee motivation and accountability. The organizational system theory which Katz and Kahn (2015) developed shows that organizations function as active systems which need information exchange to link employee work with organizational objectives. The research uses SS2 to measure communication quality because it plays a vital role in minimizing confusion and building stronger relationships between people which leads to better organizational results. The MN3 decision-making process selects leadership approaches through Fiedler's contingency theory (1964) which determines the level of team member involvement needed for decision-making. These theories explain why these two constructs function as vital performance indicators which organizations operating under public sector conditions need to monitor because they must maintain both transparency and accountability systems.

The research results from this study confirmed earlier empirical evidence which showed that organizational performance results from the communication systems and decision-making approaches organizations implement. The research by Ghofar et al. (2018) showed that workers who receive positive communication from their colleagues at work will achieve better results which confirms our model's finding that SS2 functions as the primary element which affects communication quality. Staff members at the organization follow different methods to participate in decision-making activities than what Sibuea P. (2021) showed about employee participation in performance enhancement work. The two results show different results because public sector organizations must deal with extra bureaucratic obstacles which create a stronger link between decision participation and organizational success. The research by Kang et al. (2021) shows that public sector institutions require participatory decision-making because it allows for enhanced public participation and improved institutional oversight which private sector organizations do not have.

The research findings provide essential value to public sector organizations which want to achieve operational change. Public sector organizations encounter specific obstacles which stem from political demands and restricted funding and administrative systems that create additional difficulties for their decision processes and information exchange compared to private sector businesses (Sulistiani et al., 2024). This aligns with Rahmawati et al. (2024) demonstrated that public sector organizational success depends on building positive communication environments and involving staff members in decision-making processes. The research results show that public sector performance improvement needs two essential components which include participatory decision-making (MN3) and high-quality communication (SS2). The research results from this study differ from Mykkänen (2023) who demonstrated that public sector decision-making processes become limited by regulatory systems which might prevent open participation methods from working in public organizations with hierarchical structures.

The research adds value to existing knowledge through its three main contributions which include theoretical development and methodological approaches and practical applications. The research expands current communication-performance models through the implementation of non-linear evidence which decision-tree machine learning models produced. Decision trees provide a more complex understanding of organizational factors which affect public sector performance through their interaction with communication quality and participatory decision-making processes. The extension provides researchers with advanced knowledge about public sector performance systems which need them to apply non-linear models for organizational studies.

The research findings establish vital needs which public sector organizations need to transform their operations and their leadership development programs require. The organization requires leaders to use transparent communication methods and inclusive decision-making systems because it values both communication excellence and team member involvement in decision-making processes equally. Public sector employees need training programs which teach them to improve their communication abilities with others while making decisions through inclusive practices. Public organizations can enhance their communication systems by conducting communication audits which function as assessment tools. This aligns with the findings of Gustyawan et al. (2020) demonstrated that organizations which maintain effective

communication systems between their public sector units will achieve better service delivery and their staff members will perform better. The public sector needs to build its participatory governance systems because these systems will let all staff members take part in decision-making which will improve public sector accountability and responsiveness.

The sub-splits show that Class 3 receives its main influence from three elements which are partnership and support (IP2) and current communication information (CM2) and organizational communication integration (CM9). The prediction model shows that Class 4 receives its main influence from positive impact strategy (PI10) and good communication climate (CM1) and synergy for goals (SS1) and values and culture (MN2) with values between 3 and 4.5 being significant for prediction. Decision trees tend to select the majority class (Class 5) when dealing with unbalanced data distributions because of their purity-based splitting method which creates problems for minority class prediction.

The variable of positive interpersonal communication (SS2) stands as the most important factor which determines organizational performance (PI9). The decision tree model shows that better performance predictions occur when SS2 values reach higher levels especially in Class 5 which represents the best organizational performance. Organizations achieve better workplace support through positive interpersonal communication which leads to improved team coordination and reduced workplace conflicts that boost productivity. Organizational members who communicate effectively help each other through improved information sharing to work together for solving organizational problems. Research evidence supports the conclusion that organizations achieve success through open and positive communication methods. The study by Ghofar A. and Akbar M. and Luddin M. (2018) shows that workers who excel at interpersonal communication will produce better work results which results in better organizational success. Sibuea (2021) shows in his research that manager-employee communication effectiveness and organizational communication climate directly affect performance improvement.

The research results indicate that IP2 partnership and support and CM2 current communication information and CM9 organizational communication integration do not effectively predict organizational performance (PI9). Organizations fail to achieve major performance improvements through their communication systems and support structures because they require both current strategic plans and suitable communication environments. The organizational performance prediction power of positive impact strategy (PI10) and good communication climate (CM1) and synergy for goals (SS1) and values and culture (MN2) exceeds all other variables. The research results which Rahmawati et al. (2024), support this discovery because they found that the students achieved better results when they used visual aids during their learning process, demonstrated that organizations achieve better success when their communication environment remains positive. The research by Permatasari J. and Ratnawati I. (2021) showed organizations with positive work environments develop staff motivation which leads to better workplace productivity. Organizations achieve better performance through strategic elements which include shared values and positive communication and synergy because these factors surpass the impact of communication systems and information pathways.

The model demonstrates excellent class separation based on its low entropy values which approach zero in multiple leaf nodes yet some nodes maintain high entropy values near 1. The model predicts Class 5 when indicator values are high through the combination of positive interpersonal communication (SS2) and decision-making involvement (MN3) and positive impact strategy (PI10) and problem-solving participation (AC1). The model demonstrates strong performance yet the tiny branches with 1-3 instances make us question if the model has overfit the data. The model requires improvement through decision tree pruning and cross-validation tests to reduce overfitting and determine its accuracy stability when working with different data subsets. The evaluation of feature importance will help determine which variables make the most significant contributions to organizational performance prediction (PI9).

Positive Interpersonal Communication (SS2) functions as a key performance indicator which drives organizational success according to PI9. Team members who exchange information effectively create an environment which supports teamwork and improved coordination and decreases workplace conflicts. Organizations which maintain open communication channels will

achieve better problem-solving and reach their common organizational targets. Research shows that organizations which practice positive communication methods achieve superior performance and employee contentment because open communication systems boost employee motivation and work performance (Rajhans, K., 2012). Organizations use employee participation levels in decision-making (MN3) as their main performance indicator. Strategic involvement of employees in decision-making processes leads to higher employee responsibility for these decisions which results in stronger organizational goal commitment. Organizations which use consensus to make decisions achieve superior implementation outcomes while their staff members accept these choices which results in enhanced organizational performance (Locke, E. A., and Latham, G. P., 2002). Organizations which enable employee participation in decision-making processes achieve better productivity levels and enhanced capabilities to handle fast market transformations.

The performance of organizations depends heavily on two factors: Positive Impact Strategy (PI10) and Problem-Solving Participation (AC1). Organizations can establish enduring market leadership through value development by developing strategic plans which solve current problems and generate enduring worth for all stakeholders according to Grant, A. M., and Parker, S. K. (2009). Organizations which enable their staff members to participate in problem-solving activities will achieve superior innovation and creativity and better organizational flexibility for rapid adaptation to changing business conditions while simultaneously increasing employee commitment to organizational goals and their sense of responsibility (Gustyawan et al., 2020). The process of collaborative problem-solving leads to better organizational performance because it generates superior decision results according to Nugroho, A. D., and Wahjoedi, T. (2024) who show that a good communication climate (CM1) leads to better work morale and improved individual and organizational performance.

*5. 2 Feature Importance and Model Refinement*

Organizations need positive interpersonal communication (SS2) to succeed and managers need it to perform their duties effectively. The team members achieve better results through communication which creates a supportive work environment that enhances teamwork and coordination and decreases workplace conflicts. Organizations which establish positive member communication methods will develop enhanced problem-solving capabilities that lead to better achievement of their shared objectives. The research conducted by Maslikha et al. (2022) demonstrates that employee engagement and job performance results depend heavily on organizational trust and interpersonal communication between team members. The performance predictions in classification models receive their primary influence from SS2 which functions as the leading factor. Organizations which create open and positive communication channels will achieve higher productivity levels and successfully accomplish their established targets. The positive impact strategy (PI10) stands as a vital organizational factor which helps organizations distinguish between different classes especially when comparing classes 4 and 5.

Organizations that use particular strategies will achieve sustainable competitive advantages which produce financial success and social value. Getnet Agazu, B., and Kero, C. A. (2024) show that organizations will perform better when they implement innovation strategies because these strategies help them achieve their focused goals which support the positive impact strategy (PI10) for sustainable development. The strategic planning process benefits from PI10 because it enables organizations to reach sustainable performance targets through better decision-making abilities.

The organizational processes depend on employee decision-making involvement (MN3) and partnership and support (IP2) but these elements have restricted effects. Okereka P and Aliogo E (2023) show that employee participation in organizational decision processes results in improved performance because it develops employee ownership and responsibility. The variables SS2 and PI10 have greater impact than these two but they help organizations achieve better results through employee goal commitment and ownership development. Organizations need problem-solving participation from their members to generate new ideas for innovation (AC1). Organizations achieve better performance results because their employees actively participate in making decisions which affect their daily work activities. The research by Kerrissey, M. J., and Novikov, S. (2024) shows that problem-solving teams obtain superior results because their

members understand their worth and can leverage their diverse abilities. Getnet Agazu, B., and Kero, C. A. (2024) demonstrate that teams which excel at problem-solving achieve superior results because they unite their ability to handle challenges with their creative and resilient approach. Organizations achieve better performance and improved decision-making through collaborative problem-solving practices.

The research data shows that SS2 and PI10 require evaluation because they explain more than half of the model's predictive power. The SS2 and PI10 variables show a strong connection because they impact organizational performance (PI9) by affecting both performance ratings and assessment criteria. Research shows that organizations will reach their best performance levels by executing strategic human resource management practices effectively (Goklas et al., 2021). The model performance would not suffer from removing variables with importance scores below 0.03 because these variables do not contribute significantly to the model. The method of feature selection which Theng D. and Bhoyar K. K. (2024) describe enables models to achieve higher efficiency through the elimination of unneeded features which results in improved model understanding. The analysis reveals the core design pattern of the model through its essential elements which generate predictions and allow model optimization and performance improvement.

The Decision Tree Classification model predicts organizational performance (PI9) from three explanatory variables which include employee interaction and communication maturity and organizational management. The model achieves its best class separation through entropy-based splitting. The model achieved 71% accuracy in multiclass classification which proved to be a satisfactory result for this particular task. The model achieved its best results in Class 5 because it produced precision and recall values of 0.87 and 0.76 respectively. The model performed worst on Class 3 because it contained only four samples which made it challenging to detect minority class data. The model produced a weighted F1-score of 0.71 which shows equal performance for all classes although Class 5 appears more frequently in the confusion matrix. The model maintained effective pattern recognition between classes despite its class preference toward Class 5.

The Decision Tree model needs additional performance assessment by comparing its results to logistic regression and random forest and support vector machines (SVM) models. The logistic regression model generated results which achieved 68% accuracy through precision at 0.72 and recall at 0.70. While logistic regression offers simpler interpretability, it underperforms in comparison to the Decision Tree model, which achieved 71% accuracy, precision of 0.87, and recall of 0.76. The random forest model which uses ensemble methods produced the best results by achieving 75% accuracy while showing precision and recall values of 0.80 and 0.77 but it did not provide the interpretability that Decision Tree models do. The SVM model achieved 72% accuracy but its implementation required extensive preprocessing work and various parameter settings which made it impractical for public sector decision-making applications.

The decision tree structure shows that SS2 positive interpersonal communication and PI10 positive impact strategy serve as essential components which lead organizations to achieve their performance goals. The two elements of SS2 and PI10 form the base of organizational success because they determine the overall performance of the organization. Teamwork benefits from effective communication because it creates an environment which supports both teamwork and conflict management and coordination between members. Sulistiani I. Syarifuddin and Sipakoly S. (2024) established through their study that organizations which implement enhanced team communication methods will achieve better employee dedication which leads to superior team results and organizational achievement. A team can solve problems and work together to reach common goals through positive communication which results in better organizational performance.

Organizations need PI10 as their strategically focused method to create enduring positive results which drives their competitive advantage. Getnet Agazu, B., and Kero, C. A. (2024) demonstrate organizations can enhance their market position and operational success through strategic innovation planning which makes PI10 essential for achieving sustainable business expansion. Organizations need a well-defined strategic direction to stay competitive in the long

run. SS2 and PI10 function as performance indicators for organizations which enable them to build sustainable business success platforms.

The two organizational processes of decision-making involvement (MN3) and partnership and support (IP2) maintain their importance despite their limited impact. Okereka P and Aliogo E (2023) show that employee involvement in organizational decision-making leads to better performance because it creates employee ownership which leads to increased responsibility. Organizations achieve better performance through employee decision-making participation because it establishes employee ownership and responsibility. The team collaboration improvement from IP2 enables better decision-making which produces superior organizational results. Problem-solving participation (AC1) functions as the organizational base which allows organizations to build their creative and innovative practices. Employee participation in performance-affecting decisions leads to higher employee engagement with organizational decisions. The research findings from Kerrissey, M. J., and Novikov, S. (2024) validate this discovery because their study shows that teams which work together to solve problems will achieve superior outcomes through their ability to identify common value and unite their diverse abilities. Organizations need to create open communication systems which enable staff members to join decision-making processes and work together as teams to develop an adaptable workplace that competes successfully.

## 6. Conclusions

The research shows that public sector organizations achieve their best performance through their communication systems and their decision-making processes which involve employee participation. Organizations which focus on employee decision-making participation and strategic alignment and interpersonal communication will achieve superior performance results. Machine learning decision-tree models deliver outstanding performance in identifying complex organizational behavior patterns which standard analytical methods fail to detect thus providing improved understanding of performance determining factors. The research method enables organizational studies to discover concealed relationships between organizational elements through its non-linear approach which produces better results for public sector organizations to enhance their service delivery and operational performance.

The research results contain essential information which public sector managers need to develop their policy strategies. The research results show organizations need to build their communication systems and establish decision systems which let staff members participate to reach improved performance results. Managers need to establish open communication channels which enable staff members to participate in decision-making processes to connect organizational goals with employee motivation. Public administration needs to use machine learning models for expanded decision-tree model applications which solve class imbalance problems to enhance minority class prediction accuracy and reveal organizational behavior patterns in different public sector environments. The research contains two main restrictions which stem from the particular data context and the restricted nature of the available dataset. Future research should explore the application of machine learning in broader contexts, integrating more varied data sources to improve model generalizability and test the robustness of the findings across different public sector settings.

## References

AL-Inizi, M. S. M. (2025). Enhancing governmental decision-making through predictive analytics with machine learning-based data-driven framework. *Babylonian Journal of Machine Learning, 2025*, 86-96.

Bernardin, H.J. and Russell, J.E. (1993) Human Resource Management: An Experiential Approach. McGraw-Hill, New York.

Blockeel, H., Devos, L., Frénay, B., Nanfack, G., and Nijssen, S. (2023). Decision trees: From efficient prediction to responsible AI. *Frontiers in Artificial Intelligence, 6,* Article 1124553. https://doi.org/10.3389/frai.2023.1124553

Chaabane, S., Guermazi, S., and Hammami, M. (2019). Enhancing techniques for learning decision trees from imbalanced data. *SpringerLink.* https://doi.org/10.1007/s11634-019-00354-x

Farhadpour, S., Warner, T. A., and Maxwell, A. E. (2024). Selecting and interpreting multiclass loss and accuracy assessment metrics for classifications with class imbalance: Guidance and best practices. *Remote Sensing, 16*(3), 533. https://doi.org/10.3390/rs16030533

Fiedler, F. E. (1964). A contingency model of leadership effectiveness. *Advances in Experimental Social Psychology, 1,* 149–190. https://doi.org/10.1016/S0065-2601(08)60051-9

Getnet Agazu, B., and Kero, C. A. (2024). Innovation strategy and firm competitiveness: A systematic literature review. *Journal of Innovation and Entrepreneurship, 13,* Article 24. https://doi.org/10.1186/s13731-024-00381-9

Ghofar, A., Akbar, M., and Luddin, M. (2018). The effect of interpersonal communication, self-engagement and organizational commitment toward the employee performance. *International Journal of Human Capital Management, 2*(2), 30–44. https://doi.org/10.21009/IJHCM.02.02.04

Ghonim, M. A., Khashaba, N. M., Al-Najaar, H. M., and Khashan, M. A. (2022). Strategic alignment and its impact on decision effectiveness: a comprehensive model. *International Journal of Emerging Markets*, *17*(1), 198-218.

Goklas, A., Riyanto, S., Sihombing, J., and others. (2021). Management of organizational performance: The role of human resource management strategy. *Jurnal Administrare: Jurnal Pemikiran Ilmiah dan Pendidikan Administrasi Perkantoran, 8*(1), 245–254. http://ojs.unm.ac.id/index.php/administrare/index

Grant, A. M., and Parker, S. K. (2009). Redesigning work design theory: The rise of relational and proactive perspectives. *Academy of Management Annals, 3*(1), 317–375. https://doi.org/10.1080/19416520903047327

Gunathilaka, M. D. K. L., & Wijeratne, V. P. I. S. (2022). Pro-Environmental Communication and Behavior in Sustainable Use of Environmental Resources: A Study in Kalpitiya Fisheries Inspector Division, Sri Lanka. *International Journal of Environment, Engineering and Education, 4*(2), 55–59. https://doi.org/10.55151/ijeedu.v4i2.74

Gustyawan, W., and others. (2020). The effect of interpersonal communication and organizational trust on employee engagement and their impact on job performance. *Journal of HR Management.* https://doi.org/10.38035/dijefa.v3i5.1485

Johansson, C., Grandien, C., and Strandh, K. (2019). Roadmap for a communication maturity index for organizations—Theorizing, analyzing and developing communication value. *Public Relations Review*, *45*(4), 101791. https://doi.org/10.1016/j.pubrev.2019.05.012

Johnson, J. M., and Khoshgoftaar, T. M. (2019). Survey on deep learning with class imbalance. *Journal of Big Data, 6,* Article 27. https://doi.org/10.1186/s40537-019-0192-5

Kalua, A., Wibowo, M. A., & Latumakulita, L. A. (2026). Design and Evaluation of a Decision Support System for Classifying Tourism Site Crowding and Recommending Governance Responses in Bunaken National Park. *Jurnal Testing Dan Implementasi Sistem Informasi, 4*(1), 49-59. https://doi.org/10.55583/jtisi.v4i1.2232

Kang, I. G., Kim, N., Loh, W. Y., and Bichelmeyer, B. A. (2021). A machine-learning classification tree model of perceived organizational performance in US federal government health agencies. *Sustainability, 13*(18), 10329. https://doi.org/10.3390/su131810329

Kaplan, R.S. and Norton, D.P. (1996) Strategic Learning: The Balanced Scorecard. Strategy and Leadership, 24, 18-24. https://doi.org/10.1108/eb054566

Katz, D., and Kahn, R. (2015). The social psychology of organizations. In *Organizational behavior 2* (pp. 152-168). Routledge.

Kerrissey, M. J., and Novikov, S. (2024). Joint problem-solving orientation, mutual value recognition, and performance in fluid teamwork environments. *Journal of Organizational Behavior, 45*(4), 532–554. https://doi.org/10.3389/fpsyg.2024.1288904

Kim, J. S. (2022). An empirical analysis of the relationships among participatory decision making and employees' task performance and personal growth. *Sustainability, 14*(19), 12392. https://doi.org/10.3390/su141912392

Locke, E. A., and Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist, 57*(9), 705–717. https://doi.org/10.1037/0003-066X.57.9.705

Lokeshwaran, K., Komal Kumar, N., Senthil Murugan, J., Elanangai, V., & Sathya, S. (2025). Benchmarking Transformer Models Against Classical Approaches for Fake Review Detection on the Deceptive Opinion Spam Corpus. *International Journal of Environment, Engineering and Education, 7*(3), 182–195. https://doi.org/10.55151/ijeedu.v7i3.334

Lu, M. (2025). Automated machine learning and data-driven decision support system for strategy management in organizational activities. *Journal of computing and information technology*, *33*(1), 57-71. https://doi.org/10.20532/cit.2025.1005877

Maslikha, I., Fauzi, A., Sutomo, D., and Fakhruddin, M. R. (2022). The effect of interpersonal communication and organizational trust on employee engagement and their impact on job performance. *Dinasti International Journal of Economics, Finance and Accounting.* https://dinastipub.org/DIJEFA/article/view/1485/1077

McPhee, R. D., and Zaug, P. (2000). The communicative constitution of organizations. *Building theories of organization: The constitutive role of communication*, *10*(1-2), 21.

Mintzberg, H. (1993). *Structure in fives: Designing effective organizations.* Prentice-Hall.

Mykkänen, M. (2023). The Elements of Advocacy: Finnish PR Consultants' Media Strategies in Lobbying. In *(Re) discovering the Human Element in Public Relations and Communication Management in Unpredictable Times* (pp. 193-209). Emerald Publishing Limited.

Nugroho, A. D., and Wahjoedi, T. (2024). The influence of the work environment and communication on work morale and its impact on employee performance. *World Journal Of Advanced Research And Reviews*, *21*(3), 2534-2546. https://doi.org/10.30574/wjarr.2024.21.3.0922

Okereka, P., and Aliogo, E. (2023). Participatory decision making and organizational productivity: A study of the Delta State public service. *International Journal of Management and Economics*, *7*(2), 105–120. https://doi.org/10.29103/mrbj.v3i2.14421

Park, E. Y., Yi, M., Kim, H. S., and Kim, H. (2021). A decision tree model for breast reconstruction of women with breast cancer: a mixed method approach. *International Journal of Environmental Research and Public Health*, *18*(7), 3579. https://doi.org/10.3390/ijerph18073579

Permatasari, J., and Ratnawati, I. (2021). Work climate and employee performances: A literature observation. *International Research Journal of Management, IT and Social Sciences, 8*(2), 184–195. https://doi.org/10.21744/irjmis.v8n2.1425

Porter, M. E. (1985). *Competitive advantage: Creating and sustaining superior performance.* Free Press.

Putra, F. P., Mahendra, I. G. A. P., Tedyyana, A., & Noor, M. . (2026). Improving FAQ Retrieval for Academic Regulations Using Semantic Embeddings and LLM Question Augmentation . *Jurnal Testing Dan Implementasi Sistem Informasi*, *4*(1), 1-19. https://doi.org/10.55583/jtisi.v4i1.2176

Rahmawati, M., Hayati, H. D., Syahril, S., and Kadri, H. A. (2024). Enhancing organizational success through a positive communication climate: Concept, influential factors, and practical approaches. *International Journal of Educational Dynamics, 7*(1), 145–151. https://garuda.kemdiktisaintek.go.id/documents/detail/4664985

Raj J, J. S., & Gopalan, A. (2025). Compact Bi-slot Patch Antenna with Tapered Edges for Ka-Band Applications Featuring Machine Learning-Assisted Performance Prediction. *International Journal of Environment, Engineering and Education, 7*(3), 196–207. https://doi.org/10.55151/ijeedu.v7i3.326

Rajhans, K. (2012). Effective organizational communication: A key to employee motivation and performance. *Interscience Management Review*, *2*(2), 81-85. https://www.interscience.in/imr/vol2/iss2/13

Sanjaya, M. R., Khoiriah, A., Heroza, R. I., & Putra, B. W. (2026). Analysis of User Reviews for The Mytelkomsel App Using Naïve Bayes and Random Forest Methods. *Jurnal Testing Dan Implementasi Sistem Informasi*, *4*(1), 32-48. https://doi.org/10.55583/jtisi.v4i1.2220

Saxena, N. C. (2023). Using Machine Learning to improve the performance of Public Enterprises. *Public Enterprise*, *27*(1), 39-51.

Severgnini, E., Galdaméz, E. V. C., and Moraes, R. D. O. (2018). Satisfaction and contribution of stakeholders from the performance prism model. *BBR. Brazilian Business Review*, *15*, 120-134. https://doi.org/10.15728/bbr.2018.15.2.2

Shafie, M. R., Farhadpour, S., Das, S., and Ahmed, I. (2024). Enhancing Employee Turnover Prediction with Optimized Anns and Data Augmentation: A Cluster-Based Approach in Hr Analytics. *Sarah and Das, Srinjoy and Ahmed, Imtiaz, Enhancing Employee Turnover Prediction with Optimized Anns and Data Augmentation: A Cluster-Based Approach in Hr Analytics*. https://doi.org/10.1016/j.dajour.2024.100461

Shannon, C. E. (1948). A mathematical theory of communication. *Bell System Technical Journal*, *27*(3), 379–423. https://doi.org/10.1002/j.1538-7305.1948.tb01338.x

Sibuea, P. (2021). The effect of manager–employee interpersonal communication effectiveness and organizational communication climate on employee performance in the working area of the Directorate General of State's Asset Office of North Sumatera. *Budapest International Research and Critics Institute (BIRCI) Journal, 4*(4), 11536–11547. https://doi.org/10.33258/birci.v4i4.3217

Singh, A. K. (2014). Role of interpersonal communication in organizational effectiveness. *International Journal of Research in Management and Business Studies*, *1*(4), 36-39. ISSN : 2348-6503 (Online)

Sulistiani, I., Syarifuddin, and Sipakoly, S. (2024). Dynamics of interpersonal communication in improving teamwork efficiency. *Jurnal Komunikasi dan Manajemen.* https://jkm.my.id/index.php/komunikasi/article/view/56

Theng, D., and Bhoyar, K. K. (2024). Feature selection techniques for machine learning: A survey of more than two decades of research. *Knowledge and Information Systems, 66,* 1575–1637. https://doi.org/10.1007/s10115-023-02010-5

Vijayakumar, V. S. R., and Padma, R. N. (2014). Impact of perceived organizational culture and learning on organizational identification. *International Journal of Commerce and Management, 24*(1), 40–62. https://doi.org/10.1108/IJCoMA-01-2012-0003

Yang, Q., Li, J., Zhang, Z., Wu, X., Liao, T., Yu, S., ... and Sun, J. (2021). Clinical characteristics and a decision tree model to predict death outcome in severe COVID-19 patients. *BMC infectious diseases*, *21*(1), 783.