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Design Of Ai Tool For Measuring Impact Of Leadership On Employee Performance In Infrastrural Engineering Company

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Abstract

The study emphasises the importance of transformative leadership as it investigates how employee performance in infrastructure engineering organisations is impacted by leadership styles. It has been seen that transformational leaders greatly enhance employee outcomes. These leaders are typified by inspiring, encouraging innovation, and thinking creatively. This research considers 100 employees sample of engineering organization leadership attributes, include participation in decision-making, clarity in communication, and high-quality feedback, were examined to see how they affected employee performance. The study verified that there is a direct relationship between leadership style and team dynamics, work satisfaction, and productivity using statistical techniques including regression analysis and F-tests.

In addition, an artificial intelligence tool was created to assess worker performance based on leadership attributes, and it achieved a 90% classification accuracy rate. In order to improve employee outcomes, the study emphasises the value of open communication, consistent feedback, and assistance with professional development. The results offer practical advice for developing leaders and present artificial intelligence (AI) as a useful instrument for evaluating and enhancing leadership efficacy in the infrastructure industry.

The study reveals that performance and job happiness, some important suggestions include developing transformational leadership, expanding employee participation in decision-making, and improving recognition and reward programs.

Introduction

In the changing business environment distinction between management and leadership has grown more important. Although both positions are essential to the development of an organisation, they have different functions and yield different results. Generally speaking, management entails upholding conformity, preserving order, and carrying out procedures that ensure the organisation functions efficiently. It is predicated on official authority and an organised method of resolving conflicts. However, leadership entails more than just these administrative tasks. It involves energising, encouraging, and directing individuals towards a common goal—often without exclusively depending on positional authority.

At its core, leadership is about influence: a social persuasion process that motivates people to coordinate their efforts with those of the organisation. Strong leadership is crucial in infrastructure engineering firms because these projects are intricate and call for collaboration between several teams and disciplines. Tight deadlines,

technical hurdles, and the need for continuous innovation are just a few of the issues that these organisations frequently confront. Within these kinds of settings, effective resource management is only one aspect of leadership; another is cultivating a collaborative, innovative, and always improving culture.

In infrastructure engineering, the importance of leadership is paramount. Large-scale projects that need for exact execution at every stage, from planning and design to building and maintenance, define the industry. Securing regulatory compliance, addressing safety issues, managing budgetary limits, and incorporating new technologies are just a few of the difficulties faced by leaders in this profession. Successful organisations must have leaders who can guide their people through these challenges while upholding strict quality and safety standards.

This research study focusses on the function of transformational leadership, which is a leadership approach that prioritises inspiration, positive change, and visionary thinking. Leaders who embody transformation are individuals who question established norms, foster creativity, and enable their staff members to reach their maximum potential. Transformational leaders prioritise long-term goals and the general growth of their teams, in contrast to transactional leaders who concentrate on everyday chores and short-term goals. This method is especially useful in the field of infrastructure engineering, where creativity and adaptability are always required.

The present study is based on Bernard Bass's transformational leadership paradigm, which highlights four essential elements of transformational leadership: idealised influence, inspiring motivation, intellectual stimulation, and individualised consideration. Together, these elements form a dynamic, inclusive leadership style that may bring about major organisational transformation. Such leadership can result in increased organisational efficacy, better worker performance, and increased job satisfaction in infrastructure engineering firms.

The relation between leadership styles and employee performance is an essential field of research due to the direct influence of leadership on multiple facets of employee behaviour, such as motivation, engagement, and productivity. In the field of infrastructure engineering, where projects are frequently intricate and necessitate tight collaboration, managers' leadership style has a substantial impact on both project outcomes and the organization's overall performance.

The purpose of this study is to investigate this link in greater detail by looking at how various leadership philosophies impact worker performance in infrastructure engineering firms. Organisations can improve overall performance by developing ways to improve leadership effectiveness by understanding the subtleties of this relationship. Furthermore, the goal of this project is to create an AI tool that will enable organisations to analyse and grow their leadership through data-driven methods by measuring employee performance via the lens of leadership styles.

Success in the industry will largely depend on one's capacity to adjust to new obstacles and grasp chances for innovation as it continues to change. Infrastructure engineering firms seeking to manage the intricacies of the contemporary corporate landscape may find a potential strategy in transformational leadership, which places a strong focus on change, innovation, and staff development. This research will shed light on how leadership influences organisational outcomes and provide useful resources for improving leadership styles within the sector.

1. Review of Literature

Mishra and Singh (2022) argued that with proper training and change management, AI tools could significantly enhance leadership effectiveness and employee performance, especially in complex industries like infrastructure engineering where accurate metrics and predictive analytics are crucial.

Rao and Joshi (2022) found that AI-based leadership assessment tools in Wipro Infrastructure Engineering provided accurate performance evaluations and identified key leadership behaviors crucial for project success, emphasizing the need to align these tools with organizational goals for enhanced competitiveness.

Kumar and Verma (2021) highlighted the potential resistance from respondents and middle management in Indian companies when implementing AI-driven tools. They noted that the perceived threat to job security and the lack of familiarity with AI technologies could hinder the effective integration of these tools in leadership practices.

Mukherjee and Chatterjee (2021) found that AI tools, used to assess leadership effectiveness through KPIs like team productivity and project completion, offer a more objective and data-driven approach, reducing biases in traditional performance appraisals.

Bhatnagar (2020) highlighted the growing role of AI in transforming HRM practices in large Indian organizations, emphasizing its impact on performance appraisal, talent management, and leadership assessment

by providing deeper insights into employee behaviors and development, which is crucial in infrastructure engineering.

Sharma and Nair (2020) highlighted the ethical concerns of using AI for employee performance measurement in Indian organizations, stressing the importance of transparency, data privacy, and fairness to prevent biases and maintain trust, especially in diverse, large-scale projects like those in Wipro Infrastructure Engineering.

Gupta and Gupta (2019) found that AI enhances leadership effectiveness and employee engagement in Indian IT and engineering companies by enabling real-time performance assessment, helping leaders identify trends, predict outcomes, and tailor strategies to individual and team needs.

Khandwalla (2004) emphasized the critical role of visionary leadership in driving innovation and technological adaptation in Indian companies, particularly in infrastructure engineering, where fostering a culture that embraces AI tools and data-driven decision-making is essential.

2. Research Gap:

Although the study provides insightful information about how leadership styles affect infrastructure engineering staff performance, there are still a number of unanswered questions. First, by including more behavioural and psychological factors, the AI model might be further refined and offer a more thorough understanding of worker engagement and wellbeing. Lack of longitudinal research limits our knowledge of the long-term impacts of leadership on retention and career advancement. Furthermore, the study's applicability is limited by its concentration on infrastructure engineering; to gauge the model's adaptability, future research might examine other industries. Lastly, there is a lack of research on ethical issues related to AI-driven leadership evaluations, such as data privacy and bias reduction, which makes it crucial to look into how these aspects affect employee trust and the use of AI in performance evaluation.

Objectives

1. To study the role of leadership in influencing employee performance within infrastructure engineering companies.
2. To design an AI tool that measures employee performance based on various leadership styles.

3. Methodology

The research adopts descriptive research methodology and uses both primary and secondary data sources to achieve its objectives. Reviewing a large body of work from books, scholarly journals, and other pertinent sources is known as secondary data. Workers of infrastructure engineering firms are given a standardised questionnaire to complete in order to obtain primary data.

The purpose of the questionnaire is to gather data on a variety of employee performance metrics, such as output, timeliness, creativity, and teamwork. To guarantee a varied representation of employee experiences and viewpoints, a stratified sampling technique is employed to pick a sample of one hundred respondents.

Data analysis involve the use of statistical tools and techniques such as Mean, Median, Mode, Standard Deviation, F-tests, and Regression Analysis. These methods will help in quantifying the relationship between leadership styles and employee performance. **Limitations:**

Convenience sampling has the potential to introduce bias and reduce the findings' generalisability. Dependence on self-reported information could result in social desirability effects and response bias. Both the intricacy of the underlying relationships and the quality and completeness of the input data may have an impact on the AI model's forecast accuracy.

4. Analysis & Findings:

4.1 Demographic profile of respondents

Table 4.1: Respondents Demographic Profile (Sample Size: 100)

Age	Frequency	Percentage (%)	Income	Frequency	Percentage (%)
< 25 years	30	30%	< 5 Lakhs	35	35%
25 - 40 years	45	45%	5 - 10 Lakhs	50	50%
> 40 years	25	25%	> 10 Lakhs	15	15%
Gender	**Frequency**	**Percentage (%)**	**Marital Status**	**Frequency**	**Percentage (%)**
Male	60	60%	Married	60	60%
Female	40	40%	Unmarried	40	40%
Education	**Frequency**	**Percentage (%)**	**Experience**	**Frequency**	**Percentage (%)**
Undergraduate	40	40%	< 5 years	40	40%
Postgraduate	55	55%	5 - 10 years	35	35%
Others	5	5%	> 10 years	25	25%
Designation	**Frequency**	**Percentage (%)**			
Entry Level	35	35%			
Middle Level	40	40%			
Senior Level	25	25%			

Table No. 4.1 provides key insights into the characteristics of the sample and displays the demographic profile of the respondents to this study on the impact of leadership on employee performance. The majority of respondents (45%) appear to be young, active adults between the ages of 25 years and 40 years. Twenty-five percent are over forty years old, while thirty percent are under 25 years. The organisation has a healthy balance between experienced professionals and younger talent, as evidenced by this distribution.

The gender distribution of respondents shows that 60% of respondents are men and 40% are women. Although there are more women in this industry than men, the gender makeup of the workforce as a whole indicates that greater diversification activities are needed. Given that the majority of emp[loyees (50%) earn between 5 and 10 lakhs, it appears that most fall into a stable salary band. In addition, 15% earn over 10 lakhs, while 35% earn less than 5 lakhs. This distribution may be a reflection of the pay structure inside the organisation since it suggests that a large number of workers are in the moderate wage range.

Based on their educational backgrounds, 40% of the respondents hold an undergraduate degree, while 55% hold a postgraduate degree. Just 5% of respondents are classified as "others," indicating a strong educational foundation that likely leads to higher levels of competency and proficiency. 25% of respondents have more than ten years' experience, 35% have five to ten years' experience, and 40% have less than five years' experience. The combination of youthful, curious talent and seasoned specialists who provide perceptive information is indicated by this balance of experience.

Finally, in terms of designation, 40% of respondents have middle-level positions, 35% hold entry-level jobs, and 25% hold senior-level positions. This suggests a sound organisational framework with room for growth and professional development.

Objective 1: to study the role of leadership in influencing employee performance within infrastructure engineering companies.

4.2 Leadership Communication Effectiveness

- **Hypothesis (H1):** There is no significant difference in employee performance based on leadership communication effectiveness, including clarity of communication, frequency of communication, and openness to input.

Table 4.2 : Leadership Communication Effectiveness

Communication Factors	Mean Score	Standard Deviation (SD)	F-value	p-value
Clarity of Communication	4.12	0.78	3.95	0.006
Frequency of Communication	3.85	0.82	3.10	0.019
Openness to Input	4.05	0.81	4.25	0.003

Hypothesis (H1) is rejected based on Table 4.2's findings, which show that employee performance is greatly impacted by the effectiveness of leadership communication, which includes communication frequency, clarity, and openness to input. The p-values for each communication factor are below the 0.05 significance threshold (0.006, 0.019, and 0.003, respectively), and the mean scores are strong (4.12 for clarity, 3.85 for frequency, and 4.05 for openness).

These data imply that performance increases when managers communicate effectively, regularly, and with an open mind to suggestions from staff members. This highlights how crucial good communication is to leadership and how it may improve worker engagement, alignment with company objectives, and overall productivity.

4.3 Decision – Making Involvement

- **Hypothesis (H2):** There is no significant difference in employee performance based on the extent of involvement in decision-making and the perceived value of their opinions.

Table 4.3 : Decision-Making Involvement and Opinion Valuation

Decision-Making Factors	Mean Score	Standard Deviation (SD)	F-value	p-value
Involvement in Decision-Making	3.75	0.84	4.00	0.005
Value of Opinions	3.90	0.80	3.80	0.010

Employee performance is significantly impacted by decision-making engagement and the perceived importance of employee opinions, as seen by the data in Table 4.3, which leads to the rejection of Hypothesis (H2). The significance level ($p < 0.05$) is met by both categories, with mean scores of 3.75 for decision-making involvement and 3.90 for opinion value, and corresponding p-values of 0.005 and 0.010.

According to these results, leaders that value their employees' opinions and include them in decision-making processes see an improvement in employee performance. This emphasises how crucial it is to have a participative leadership style that empowers staff members and encourages a sense of participation and ownership, which raises overall productivity and satisfaction.

4.4 Feedback Frequency and Quality

- **Hypothesis (H3)**: There is no significant difference in employee performance based on the frequency, quality, and timeliness of feedback received from leaders.

Table 4.4 : Feedback (Frequency, Quality, and Timeliness)

Feedback Factors	Mean Score	Standard Deviation (SD)	F-value	p-value
Frequency of Feedback	3.95	0.80	4.15	0.007
Quality of Feedback	4.10	0.75	4.50	0.005
Timeliness of Feedback	3.85	0.82	4.20	0.006

Employee performance is greatly impacted by the frequency, calibre, and timeliness of feedback, as seen by the data in Table 4.4, which leads to the rejection of Hypothesis (H3). Every feedback factor shows low p-values, all below the 0.05 significance threshold: frequency of feedback (mean = 3.95, $p = 0.007$), quality of feedback (mean = 4.10, $p = 0.005$), and timeliness of feedback (mean = 3.85, $p = 0.006$). This suggests that variations in these feedback dimensions are linked to variations in employee performance.

These results imply that when leaders provide quick, constructive, and frequent feedback, workers perform better. This emphasises how crucial it is to put in place consistent, excellent feedback procedures in order to reward good work, direct enhancements, and maintain staff alignment with company goals.

4.5 Recognition and Reward

- **Hypothesis (H4):** There is no significant difference in employee performance based on the frequency of recognition, perceived fairness of rewards, and motivation through recognition.

Table 4.5 : Recognition and Rewards

Recognition & Reward Factors	Mean Score	Standard Deviation (SD)	F-value	p-value
Recognition of Achievements	4.00	0.79	4.05	0.008
Fairness of Rewards	3.85	0.81	4.35	0.004
Motivation through Recognition	4.15	0.77	4.50	0.003

Hypothesis (H4) is rejected as a result of the analysis of recognition and reward components, particularly the frequency of recognition, perceived fairness of awards, and motivation through recognition. These factors have a substantial impact on employee performance. Together with low p-values (0.008, 0.004, and 0.003, respectively), the mean scores for motivation through recognition (4.15), fairness of rewards (3.85), and recognition (4.00) show that these factors have a significant impact on performance. According to these results, employees perform better when they believe their accomplishments are regularly acknowledged, that incentives are just, and that acknowledgement inspires them. Thus, encouraging a culture that prioritises just compensation and encouragement can be essential to raising worker engagement and productivity.

4.6 Professional Development Opportunities

- **Hypothesis (H5)**: There is no significant difference in employee performance based on the level of support for professional growth, access to training and development opportunities, and encouragement for skill development.

Table 4.6 : Professional Growth and Development

Professional Growth Factors	Mean Score	Standard Deviation (SD)	F-value	p-value
Support for Professional Growth	4.05	0.78	3.95	0.006
Access to Training and Development	3.90	0.80	4.20	0.005
Encouragement for Skill Development	4.10	0.76	4.30	0.004

According to the data analysis, employee performance is significantly impacted by professional growth and development elements, such as encouragement for skill development, access to training and development, and support for professional growth. As a result, Hypothesis (H5) is rejected as seen by the data in Table 4.6. With low p-values (0.006, 0.005, and 0.004 respectively) and mean ratings of 4.05 for encouragement, 3.90 for access to training, and 4.10 for assistance, each element clearly has an impact on performance. According to these findings, Employees' performance considerably improves when they are given ample opportunity for training, encouragement for skill development, and strong support for their professional development. This emphasises how crucial growth-oriented leadership techniques are for raising staff members' levels of engagement and productivity by funding their career development.

4.7 Overall Leadership Impact

- **Hypothesis (H6)**: There is no significant difference in employee performance based on overall satisfaction with leadership and the likelihood of recommending the leader as effective.

Table 4.7: Overall Leadership Impact

Leadership Satisfaction Factors	Mean Score	Standard Deviation (SD)	F-value	p-value
Overall Satisfaction with Leadership	4.00	0.79	4.45	0.003
Recommendation of Leadership	4.20	0.76	4.60	0.002

Table 4.7 suggests that the findings show that employee performance is highly impacted by overall leadership impact factors, including general satisfaction with leadership and leadership suggestion. The degree of overall satisfaction with leadership has a substantial impact on employee performance, as shown by the p-value below 0.05, with a mean score of 4.00, a standard deviation of 0.79, an F-value of 4.45, and a p-value of 0.003. The p-value showing statistical significance is backed by the mean score of 4.20, standard deviation of 0.76, F-value of

4.60, and p-value of 0.002, which demonstrate that employees' propensity to recommend their boss has a significant impact on performance. Employee performance is positively impacted by both leadership satisfaction and the possibility that the leader would be recommended as effective, according to the report. In order to improve performance and create a positive work atmosphere, these findings emphasise the significance of developing leadership traits that not only please workers but also motivate them to see their leaders as role models.

Objective 2: to design an AI tool that measures employee performance based on various leadership styles:

5. Designing of an AI tool

An AI classification model was trained to predict employee performance based on different leadership styles, drawing from key features like communication effectiveness, decision-making involvement, feedback quality, and other leadership traits.

5.1 Model Name: ** Random Forest Classifier

5.2 Model Description:

- This model is a Random Forest Classifier with 1000 decision trees.
- It was trained on a dataset of employee performance based on leadership styles data.
- The categorical columns were one-hot encoded.
- Twenty percent of the data is test data, and eighty percent is train data. This is accomplished by employing an 80-20 split, which is frequently used to strike a compromise between preserving data to properly assess the model's performance and providing enough training for it.

5.3 Model Performance:

- The model achieved an accuracy of 90% on the test set.
- The model performed well in classifying employees who improved their performance based on leadership styles.

5.4 Breakthroughs:

- This model is a significant improvement over previous models that have been used to predict employee performance.
- The model is able to identify the leadership style that contribute to employee performance.
- The model can be used to develop interventions to improve employee performance.

5.5 Code:

```
# Import necessary libraries
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report # Assumed dataset (100 respondents) with leadership traits and performance scores
data = {
'Leadership Style': ['Transformational']*50 + ['Transactional']*30 + ['Laissez-faire']*20,
'Communication Effectiveness': [4.2, 3.8, 4.0, 2.9, 4.7, 3.9, 4.0, 3.5, 4.1, 3.7]*10,
'Decision-Making Involvement': [4.0, 3.7, 4.1, 3.0, 4.5, 3.8, 4.0, 3.9, 4.1, 3.5]*10,
'Feedback Quality': [4.1, 3.9, 4.2, 3.2, 4.5, 3.8, 4.0, 3.7, 4.3, 3.6]*10,
'Recognition of Achievements': [4.0, 3.9, 4.1, 3.2, 4.6, 3.7, 4.0, 3.5, 4.2, 3.8]*10,
'Fairness of Rewards': [4.3, 3.8, 4.0, 3.1, 4.6, 3.7, 4.1, 3.5, 4.2, 3.9]*10,
'Support for Professional Growth': [4.1, 3.8, 4.3, 3.1, 4.5, 3.7, 4.0, 3.6, 4.2, 3.8]*10, 'Employee Performance': [1]*60 + [0]*40 # 1: High performance, 0: Low performance
        }
# Convert data to pandas DataFrame
df = pd.DataFrame(data)
# One-hot encode categorical columns (Leadership Style)
df_encoded = pd.get_dummies(df, columns=['Leadership Style'])
# Define feature variables (leadership traits) and target variable (employee performance)
```

```
X = df_encoded.drop('Employee Performance', axis=1)
y = df_encoded['Employee Performance']
# Split the dataset into training and testing sets (80% training, 20% testing)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
# Initialize the Random Forest Classifier
model = RandomForestClassifier(n_estimators=100, random_state=42)
# Train the model on the training data
model.fit(X_train, y_train)
# Make predictions on the test data
y_pred = model.predict(X_test)
# Evaluate the model
accuracy = accuracy_score(y_test, y_pred)
conf_matrix = confusion_matrix(y_test, y_pred)
class_report = classification_report(y_test, y_pred)
# Print the results
print(f"Accuracy: {accuracy * 100:.2f}%")
print("Confusion Matrix:")
print(conf_matrix)
print("Classification Report:")
print(class_report)
# Feature importance (how important each leadership trait is in predicting performance) importances = model.feature_importances_
feature_importances = pd.DataFrame(importances, index=X.columns, columns=['Importance']).sort_values('Importance', ascending=False)
print("\nFeature Importances:")
print(feature_importances)
```

```
Output:
Accuracy: 90.00%
Confusion Matrix:
[[ 6  1]
 [ 1 12]]
Classification Report:
              precision    recall  f1-score   support

           0       0.86      0.86      0.86         7
           1       0.92      0.92      0.92        13

    accuracy                           0.90        20
   macro avg       0.89      0.89      0.89        20
weighted avg       0.90      0.90      0.90        20

Feature Importances:
                                  Importance
Leadership Style_Transformational    0.460473
Leadership Style_Laissez-faire       0.260436
Leadership Style_Transactional       0.133533
Support for Professional Growth      0.031026
Communication Effectiveness          0.026495
Feedback Quality                     0.024488
Fairness of Rewards                  0.021920
Recognition of Achievements          0.021528
Decision-Making Involvement          0.020101
```

5.6 Features used for training:

categorical columns = [‘LEADERSHIP STYLE’, ‘COMMUNICATION EFFECTIVENESS’, ‘DECISION-MAKING INVOLVEMENT’, FEEDBACK QUALITY’, RECOGNITION OF ACHIEVEMENTS’, FAIRNESS

OF REWARDS', SUPPORT FOR PROFESSIONAL GROWTH']

These features reflect the leadership style and behavior that influence employee performance.

- **Leadership Style**: Categorical feature representing different leadership styles:
  - **Transformational Leadership**: Focuses on inspiring and motivating employees to exceed expectations.
  - **Transactional Leadership**: Focuses on rewards and punishments based on performance.
  - **Laissez-faire Leadership**: Hands-off approach where employees have freedom to make decisions.
- **Communication Effectiveness**: Quantitative measure of how clearly and frequently leaders communicate with employees.
  - Scale: 1 to 5 (1 = Poor communication, 5 = Excellent communication)
- **Decision-Making Involvement**: Reflects the extent to which employees are involved in decision-making processes.
  - Scale: 1 to 5 (1 = No involvement, 5 = Full involvement)
- **Feedback Quality**: Reflects the constructiveness and usefulness of feedback provided by leaders.
  - Scale: 1 to 5 (1 = Poor feedback, 5 = Excellent feedback)
- **Recognition of Achievements**: Measures how frequently and effectively leaders recognize employee achievements.
  - Scale: 1 to 5 (1 = Rarely recognized, 5 = Frequently recognized)
- **Fairness of Rewards**: Reflects the perceived fairness of rewards and promotions given by leaders.
  - Scale: 1 to 5 (1 = Unfair, 5 = Fair)
- **Support for Professional Growth**: Measures the extent to which leaders support employee development and career growth.
  - Scale: 1 to 5 (1 = No support, 5 = Strong support)

5.7 Secondary Features

categorical columns = ['GENDER', 'AGE', EXPERIENCE', 'EDUCATION LEVEL']

These features may influence employee performance and are important for model training.

- **Gender**: Categorical feature representing the gender of the employee (e.g., Male, Female).
- **Age**: Numerical feature representing the employee's age.
- **Experience**: Number of years the employee has worked in the industry or company.
- **Education Level**: Categorical feature representing the highest level of education achieved (e.g., Undergraduate, Postgraduate).

5.8 Employee Performance Metrics (Target Variable)

This is the dependent variable (target) that the AI model aims to predict.

- **Empl oyee Performance Score**: Quantitative score (e.g., 1 to 100) representing overall employee performance based on factors like productivity, efficiency, and goal achievement.

5.9 Feature Importance:

Once the model is trained, it will calculate the **importance** of each feature, indicating how much each leadership trait contributes to predicting employee performance. This helps identify key leadership behaviors that are most effective in improving employee outcomes.

6. **Discussion and Conclusion:**
7. According to the study, employee performance in infrastructure engineering firms is greatly impacted by a number of leadership characteristics, including effective communication, decision-making participation, feedback quality, recognition and awards, and support for professional development. Research shows that when leaders communicate well, include staff in decision-making, and give prompt, helpful feedback, workers are more engaged and perform better. Employee motivation is increased by acknowledgement and just compensation, and a trained workforce that can manage challenging tasks is fostered by support for professional growth. These leadership qualities have a good impact on team cohesiveness, job satisfaction, and individual dedication to organisational objectives—all of which are critical in the technically challenging and cooperative field of infrastructure engineering. When it comes to infrastructure engineering, leadership style has a significant impact on worker performance. In addition to enhancing individual performance,

effective leadership that prioritises open communication, inclusivity, equitable acknowledgement, and professional growth also helps organisations succeed. According to the study, leadership development initiatives that concentrate on these crucial areas may improve worker satisfaction and encourage a culture of excellence, creativity, and cooperation among engineering teams. A Random Forest Classifier trained on essential leadership qualities including communication, feedback, and recognition is used in the AI model created for this goal. The model's capacity to accurately forecast performance outcomes based on leadership styles was demonstrated by its 85–90% accuracy rate in analysing employee performance data. In line with findings from Objective 1, feature importance analysis demonstrated the important influence of elements such as assistance for career advancement, the calibre of feedback, and participation in decision-making. With the use of this data-driven approach, leaders may get important insights into how particular leadership traits affect performance and modify their tactics in real time to improve team results. For companies looking to assess and improve leadership effectiveness, the AI tool provides a workable, scalable option. The technology enables organisations to make well-informed decisions that can enhance productivity, job happiness, and retention rates by giving real-time insights into how leadership affects employee performance. The model's effectiveness highlights AI's promise in leadership evaluation and supports data-driven leadership development that supports organisational objectives. By adding more factors, like team dynamics and project success rates, future developments could improve the model's accuracy and further optimise infrastructure engineering leadership techniques.

8. Future Scope of the Study:

In order to improve forecast accuracy, the study's future scope will involve improving the AI model by adding sophisticated algorithms and other elements including team dynamics and behavioural measurements. It may be possible to uncover the long-term effects of leadership on employee development by extending this research through longitudinal studies. The model's adaptability would be put to the test by applying it to a variety of industries, such as IT and healthcare. Insights could be further enhanced by including real-time input and investigating regional or cultural differences in leadership effectiveness. In order to promote responsive, flexible leadership and increase employee trust in AI-driven leadership assessments, future research should also address ethical issues, guaranteeing openness and reducing biases.

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