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IJM

International Journal of Management

Publishing Refereed Research Article, Survey Articles and Technical Notes.

ISSN Print: 0976-6502 / ISSN Online: 0976-6510

IAEME Publication

Chennai, India

editor@iaeme.com/ iaemedu@gmail.com

https://iaeme.com/Home/journal/IJM

International Journal of Management (IJM)
Volume 16, Issue 3, May-June 2025, pp. 230-242, Article ID: IJM_16_03_017
Available online at https://iaeme.com/Home/issue/IJM?Volume=16&Issue=3
ISSN Print: 0976-6502; ISSN Online: 0976-6510; Journal ID: 6251-7894
Impact Factor (2025): 13.89 (Based on Google Scholar Citation)
DOI: https://doi.org/10.34218/IJM_16_03_017

ANALYZING THE IMPACT OF LEADERSHIP STYLES ON EMPLOYEE SATISFACTION IN THE AUTOMOBILE INDUSTRY USING NEURAL NETWORK MODELING: AN EMPIRICAL APPROACH

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Abstract

This study explores the influence of various leadership styles on employee satisfaction within the automobile industry using the Neural Network (NN) modeling approach. The research aims to identify the most significant leadership traits that contribute to overall employee satisfaction by applying advanced predictive analytics. Data was collected through structured questionnaires administered to employees across multiple automobile firms. The neural network model was trained to evaluate complex, non-linear relationships between leadership dimensions and satisfaction indicators. The results reveal key leadership components—such as transformational leadership, participative decision-making, and communication transparency—that significantly

enhance employee satisfaction. The study provides actionable insights for HR managers and organizational leaders in the automobile sector, emphasizing the importance of data-driven strategies for leadership development and employee retention.

Keywords: Employee Satisfaction, Leadership Styles, Neural Network Modeling, Automobile Industry, Transformational Leadership, Predictive Analytics, HR Strategy, Employee Retention

Cite this Article: S. Manju Bharathi, V. Ramesh Kumar. (2025). Analyzing the Impact of Leadership Styles on Employee Satisfaction in the Automobile Industry Using Neural Network Modeling: An Empirical Approach. *International Journal of Management (IJM)*, 16(3), 230-242.

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1. INTRODUCTION

The automobile industry is a vital contributor to economic growth, employment generation, and technological advancement. In this high-paced and innovation-driven sector, effective leadership is fundamental to managing workforce dynamics and ensuring organizational success. One of the most critical factors that reflect the well-being and performance of employees is their level of job satisfaction. Employee satisfaction is influenced by a variety of organizational and interpersonal factors, among which leadership style holds a central position.

Leadership style refers to the approach and behavior exhibited by leaders in guiding, motivating, and managing teams. It affects how employees perceive their roles, interact with their colleagues, respond to organizational challenges, and ultimately how satisfied they are in their professional environment. In the context of the automobile industry, where productivity, precision, and teamwork are essential, the influence of leadership on employee satisfaction becomes even more pronounced *(Yaghoubipoor et. al, 2013).*

Existing literature has recognized the significant role of leadership in shaping organizational culture and employee morale. However, there remains a need for deeper empirical analysis that can capture the multifaceted and often non-linear relationship between leadership behaviors and employee satisfaction outcomes. Traditional linear models may not fully uncover the hidden patterns and interdependencies within organizational settings. Therefore, the use of advanced analytical methods such as Neural Network modeling is gaining importance in human resource research *(Palmer, 2016).*

Neural Network modeling, which is inspired by the functioning of the human brain, is capable of processing complex data and identifying patterns that conventional methods might overlook. This approach allows researchers to model interactions among variables with greater precision and predictive accuracy. In this study, Neural Network modeling is applied to analyze the impact of leadership styles on overall employee satisfaction within the automobile industry. The research focuses on identifying which leadership traits are most influential and how they contribute to creating a supportive and engaging workplace *Sinniah et. al (2022).*

By utilizing data collected from employees working in various automobile firms, this study aims to provide evidence-based insights for organizational leaders and human resource professionals. The findings are expected to support the development of leadership strategies that not only enhance employee satisfaction but also contribute to long-term organizational sustainability. Furthermore, the integration of artificial intelligence into leadership research introduces a progressive shift towards data-driven human resource management practices.

This research adds to the growing body of knowledge that emphasizes the importance of leadership in employee-centered management. It also offers practical implications for industry practitioners seeking to foster positive workplace environments and build resilient organizational cultures in the rapidly evolving automobile sector.

2. REVIEW OF LITERATURE

Cetin et al (2012) investigated the different leadership styles and communicative skills of top Turkish bank employees and the effect their leadership has on the lower-level employees' work ethic and motivation. The empirical findings of this study show that there is a strong relationship between transactional leadership style and communicative skills Transformational Leadership Job Satisfaction Organizational Commitment 5 with job satisfaction, but there is not a significant relationship between individualized and transformational leadership styles with job satisfaction.

Employee dissatisfaction stems from a variety of factors, including, but not limited to, unfair treatment by management, poor recruitment, selection and compensation practices, unrealistic promotion policies and unfavourable working conditions *(Ntimba et al., 2021).* Organizational leadership styles act as a catalyst JFM for either positive or negative effects of these factors on employee performance *(Lian and Tui, 2012).*

Leadership styles significantly influence employee satisfaction, motivation, and performance across industries. Oyewobi (2024) developed a conceptual model linking leadership styles to employee commitment, emphasizing job satisfaction as a key mediating factor. His findings suggest that while direct effects are limited, satisfaction strongly enhances commitment. Similarly, *Megawaty et al. (2022)* found that effective leadership, characterized by empathy, consultation, and personal attention, boosts motivation and performance at PT Semen Tonasa. Leaders who model appropriate behavior and prioritize employee development improve organizational loyalty. Their study also highlights that motivation is a critical force driving employee performance. Both studies reinforce the need for adaptive, employee-centered leadership approaches.

Recent studies have emphasized the importance of leadership styles in influencing employee satisfaction and organizational outcomes. Transformational and participative leadership have consistently shown positive effects on motivation and job commitment. However, research has predominantly focused on developed countries, overlooking contextual factors in emerging economies. *Oyewobi (2024)* highlighted this gap and developed a conceptual model to examine latent variables influencing employee commitment. His findings, using PLS-SEM, showed that while leadership styles had a limited direct effect, job satisfaction acted as a strong mediator. This underscores the indirect but significant role of leadership in fostering organizational loyalty. Neural network models are now increasingly applied to explore such complex relationships in greater depth.

Recent studies have emphasized the critical role of leadership styles in shaping employee satisfaction and performance. Oyewobi (2024) found that job satisfaction acts as a mediator between leadership styles and employee commitment, especially in developing economies. *Megawaty et al. (2022)* reinforced this by showing that empathetic and exemplary leadership enhances employee motivation and commitment. *Marnoto et al. (2025)* added that leadership style significantly influences both job satisfaction and employee performance, with job satisfaction acting as a mediating variable. Their findings also suggest that while workload has no direct impact, it indirectly affects performance through satisfaction. Collectively, these studies highlight the importance of leadership-focused strategies in improving organizational outcomes.

3. STATEMENT OF THE PROBLEM

In the highly competitive and rapidly evolving automobile industry, employee satisfaction plays a pivotal role in driving productivity, innovation, and retention. Leadership style is a key determinant of how employees perceive their work environment, engage with organizational goals, and perform their roles. Despite extensive research on the link between leadership and employee satisfaction, much of the existing literature relies on traditional linear models, which may not adequately capture the complex, nonlinear relationships that exist in real-world organizational settings. Furthermore, most studies are concentrated in developed economies, with limited empirical evidence from emerging markets such as India's automobile sector. There is a critical need to explore how different leadership styles influence employee satisfaction using advanced analytical tools like neural network modeling. Such an approach can reveal hidden patterns and provide deeper insights into the dynamics between leadership behavior and workforce morale. The absence of such data-driven analysis creates a gap in designing effective leadership strategies tailored to the unique challenges of the automobile industry.

4. OBJECTIVES OF THE STUDY

1. To examine the influence of various leadership styles on employee satisfaction in the automobile industry.
2. To apply neural network modeling to identify the most significant leadership factors affecting employee satisfaction.

5. RESEARCH METHODOLOGY

This study adopts a quantitative and analytical research design to investigate the impact of leadership styles on employee satisfaction within the automobile industry, using Neural Network (NN) modeling for predictive analysis. The objective is to identify key leadership attributes that significantly influence employee satisfaction and to model the complex relationships among these variables.

Research Design: A descriptive and causal research approach was employed to establish both the current state of leadership practices and their effect on employee satisfaction.

The use of a predictive modeling technique, specifically the neural network approach, allowed for the analysis of nonlinear and complex interactions among variables.

Population and Sampling: The target population consists of employees working in various departments (production, sales, marketing, administration, and technical support) within selected automobile companies located in major industrial hubs. A stratified random sampling method was used to ensure diversity in job roles and organizational hierarchy. The proposed sample size was approximately 300–400 respondents, ensuring adequate representation for model training and validation.

Data Collection Methods: Primary data was collected through a **structured questionnaire**, which was developed based on existing standardized scales:

- **Leadership styles** were measured using items adapted from the Multifactor Leadership Questionnaire (MLQ), covering transformational, transactional, and laissez-faire styles.
- **Employee satisfaction** was measured using a modified version of the Job Satisfaction Survey (JSS), capturing various facets such as work environment, supervision, recognition, and role clarity.

The questionnaire used a **five-point Likert scale** ranging from "Strongly Disagree" to "Strongly Agree."

Data Analysis Techniques: The collected data was analyzed using IBM SPSS Statistics software. Initially, descriptive statistics such as mean, standard deviation, and frequency distributions were used to understand the demographic profile of the respondents and summarize the data. To examine the relationship between leadership styles and employee satisfaction, the following statistical techniques were employed:

Ethical Considerations: Participation was voluntary, and confidentiality of responses was assured. Informed consent was obtained from all participants prior to data collection.

Limitations: The study is limited to selected firms within the automobile industry and may not be generalizable to other sectors. Additionally, the neural network model's interpretability may be constrained compared to traditional statistical models, but its predictive capability compensates for this limitation.

6. ANALYSIS OF OVERALL SATISFACTION OF THE EMPLOYEES ON INFLUENCE OF LEADERSHIP STYLES BY USING THE NEURAL NETWORK (NN) METHOD

Employee satisfaction is a critical determinant of organizational success, and leadership style plays a significant role in shaping how employees perceive their work environment and overall job experience. Effective leadership fosters motivation, trust, and engagement, leading to improved satisfaction and performance, while poor leadership can result in disengagement and turnover. Traditional analytical methods often fail to capture the complex, nonlinear relationships between leadership behaviors and employee satisfaction. To address this gap, the present study employs the Neural Network (NN) method to analyze how various leadership styles influence overall employee satisfaction. By leveraging the predictive power of neural networks, this research aims to provide deeper, data-driven insights that can guide organizations in developing leadership approaches that enhance employee well-being and productivity. The architecture which provides the best fit for the data is the network with six input layers, fifteen covariate variables and one hidden layers and one output layer, as shown in figure 1.

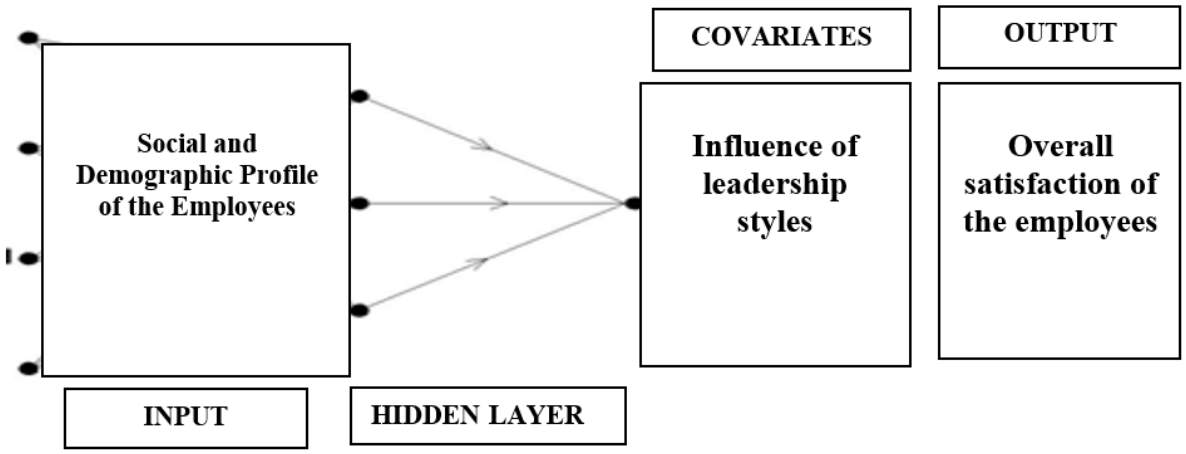

Figure – 1

Basic Neuron Model for Overall satisfaction of the employees on influence of leadership styles

The model used in this work is the Feed Forward Multilayer perception, using the Back Propagation Algorithm. Where (4-3-1)

6-Input layers

15-Covariates layers

1-Hidden layers

1-Output layer

All inputs are analyzed in the experimental validation part, with appropriate output results by the illustration of graphs so that the influences of the parameters of tensile strength are taken into consideration. The network information is presented in the table. The validation of the estimated NN and Experimental value illustrations is shown in Figure.

Table - 1

Model Summary for Neural Network Model for influence of leadership styles

Training	Sum of Squares Error	199.867
	Relative Error	.994
	Stopping Rule Used	1 consecutive step(s) with no decrease in error[a]
	Training Time	0:00:00.61
Testing	Sum of Squares Error	81.203
	Relative Error	.926
Dependent Variable: Overall satisfaction of the employees		
a. Error computations are based on the testing sample.		

Source: Output generated from SPSS 21.

The neural network model summary shows a Sum of Squares Error of 199.867 for training and 81.203 for testing, with relative errors of 0.994 and 0.926 respectively, indicating that the model has limited predictive accuracy in estimating employee satisfaction based on leadership styles. The training stopped after one step with no decrease in error, suggesting minimal improvement during model learning. While the model ran efficiently with a short training time, the high relative error values imply that it may not effectively capture the relationship between leadership styles and overall employee satisfaction, and further refinement of inputs or model parameters may be necessary for better performance.

Table – 2

Neural Network Model for Overall satisfaction of the employees on influence of leadership styles

Input Layer	Factors	1	Age Group
		2	Gender
		3	Educational Qualification
		4	Designation of the employees
		5	Monthly Income

		6	Experience in Automobile Industry
	Covariates	1	Leadership Influence
		2	Job Satisfaction Level
		3	Performance Excellence
		4	Workplace Discipline
		5	Productivity Boost
		6	Employee Engagement
		7	Organizational Loyalty
		8	Structured Environment
		9	Positive Self-Esteem
		10	Team Cohesion
		11	Conflict Reduction
		12	Managerial Trust
		13	Continuous Improvement
		14	Goal Commitment
		15	Goal Alignment
	Number of Units[a]		41
	Rescaling Method for Covariates		Standardized
Hidden Layer(s)	Number of Hidden Layers		1
	Number of Units in Hidden Layer 1[a]		6
	Activation Function		Hyperbolic tangent
Output Layer	Dependent Variables	1	Overall satisfaction of the employees
	Number of Units		1
	Rescaling Method for Scale Dependents		Standardized
	Activation Function		Identity
	Error Function		Sum of Squares
a. Excluding the bias unit			

Source: Output generated form SPSS 21.

The factors of the influence of leadership styles model parameters are modelled by using the Neural Network Method. The parameters are optimized so as to determine the set of parameters, which will influence the increase in the Overall satisfaction of the employees on influence of leadership styles by using Neural Networks Architecture and network information.

Table – 3

Independent Variable importance for Neural Network Model for the Overall satisfaction of the employees on influence of leadership styles

Independent Variable Importance	Importance	Normalized Importance
Age Group	.052	64.8%
Gender	.008	9.4%
Educational Qualification	.032	39.8%

Designation of the employees	.064	79.3%
Monthly Income	.053	65.7%
Experience in Automobile Industry	.063	77.4%
Leadership Influence	.069	85.6%
Job Satisfaction Level	.032	39.1%
Performance Excellence	.053	65.1%
Workplace Discipline	.069	85.6%
Productivity Boost	.081	100.0%
Employee Engagement	.064	79.6%
Organizational Loyalty	.013	15.9%
Structured Environment	.075	93.0%
Positive Self-Esteem	.039	47.8%
Team Cohesion	.026	32.3%
Conflict Reduction	.068	84.6%
Managerial Trust	.035	43.9%
Continuous Improvement	.074	91.9%
Goal Commitment	.013	16.0%
Goal Alignment	.016	20.0%

Source: Output generated from SPSS 21.

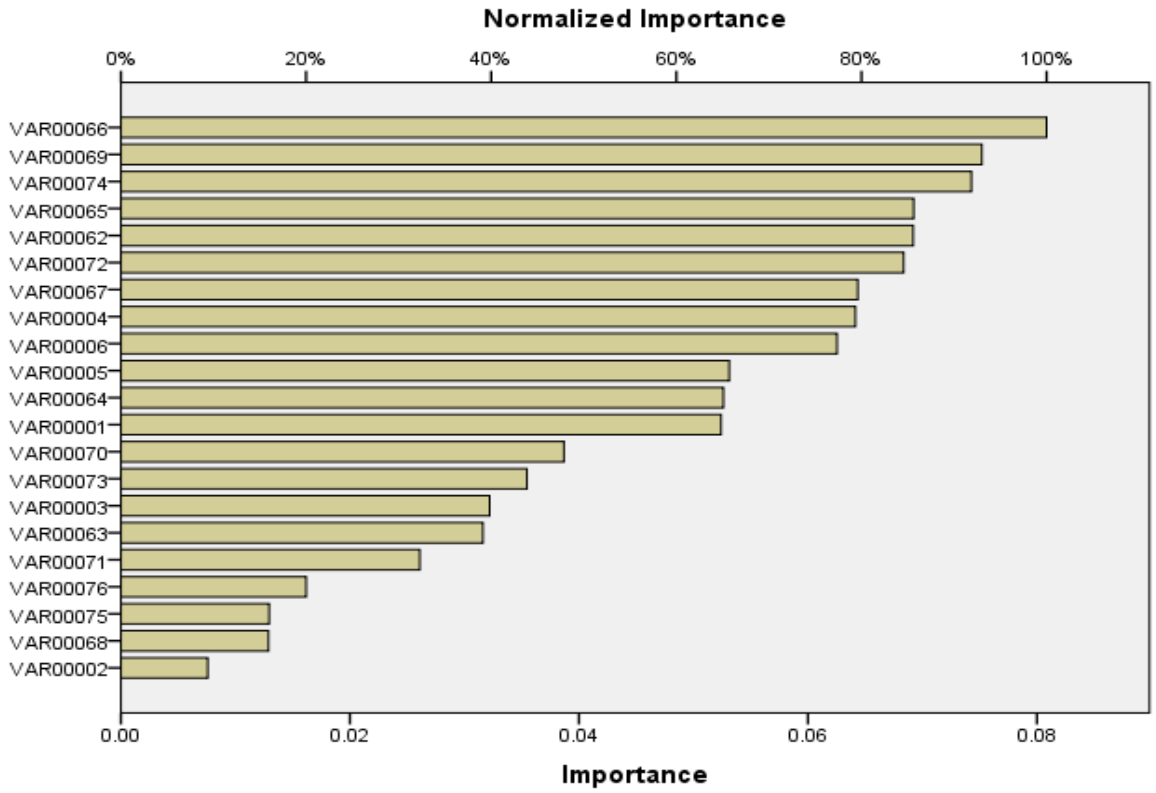

Figure – 4.4

Normalized importance for the Overall satisfaction of the employees on influence of leadership styles

7. CONCLUSION

The neural network model developed for this study utilized a wide range of input variables comprising both demographic factors and leadership-related behavioral traits (covariates) to predict the overall satisfaction of employees. The model architecture included a single hidden layer with six units, using the hyperbolic tangent activation function, which is well-suited for handling nonlinear relationships. The output layer had one unit representing the dependent variable—overall employee satisfaction—with an identity activation function, making it suitable for continuous prediction. The model's covariates were standardized, ensuring uniform scaling of the variables, which improves the efficiency and accuracy of neural network learning. The error function used was sum of squares, a common choice in regression-style prediction models.

Among the covariates, "Productivity Boost" showed the highest normalized importance (100%), indicating it is the strongest predictor of employee satisfaction in the context of leadership influence. This suggests that leadership styles that promote higher productivity directly lead to greater employee satisfaction. Close behind were "Structured Environment" (93%) and "Continuous Improvement" (91.9%), showing that employees highly value a well-organized workplace and leadership that fosters constant growth and learning. "Leadership Influence" and "Workplace Discipline", each with 85.6% importance, were also key contributors, reflecting that employees respond positively to leaders who maintain structure and exhibit strong influence without micromanaging. "Employee Engagement" (79.6%), "Designation" (79.3%), and "Experience in the Automobile Industry" (77.4%) further demonstrated that both intrinsic job roles and the leaders' ability to engage employees are critical components of satisfaction.

In contrast, variables such as "Gender" (9.4%), "Organizational Loyalty" (15.9%), "Goal Alignment" (20%), and "Goal Commitment" (16%) had relatively low predictive importance. This implies that demographic characteristics and long-term alignment or loyalty are not as immediately impactful as active leadership behavior and workplace environment in determining satisfaction. Overall, the neural network model reveals that employee satisfaction in the automobile industry is more heavily influenced by tangible leadership actions—such as promoting productivity, maintaining discipline, creating structure, and encouraging continuous improvement—than by demographic or abstract psychological traits. These findings emphasize the need for leaders in the industry to adopt behavior-based strategies that foster a performance-driven and supportive environment.

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Citation: S. Manju Bharathi, V. Ramesh Kumar. (2025). Analyzing the Impact of Leadership Styles on Employee Satisfaction in the Automobile Industry Using Neural Network Modeling: An Empirical Approach. International Journal of Management (IJM), 16(3), 230-242.

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