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Leadership Styles in the Automobile Manufacturing Industry: An Optimization-Based Approach

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ABSTRACT
The automobile industry is a multifaceted sector where leadership plays a pivotal role in driving innovation, efficiency, and adaptability. This study investigates the relationship between seven leadership styles—Autocratic, Democratic, Transformational, Transactional, Laissez-Faire, Servant, and Situational and seven distinct automobile manufacturing types, including R&D divisions, electric vehicle startups, and traditional assembly-line production. A Chi-Square Test of Independence confirmed a statistically significant association between leadership preferences and industry segments. Subsequently, the Assignment Problem technique was employed to optimally match each leadership style to a specific sector, maximizing alignment based on respondent preferences. The findings reveal that Transformational leadership is best suited for R&D, Autocratic leadership for traditional manufacturing, and Servant leadership for sustainable vehicle production. These insights provide actionable recommendations for industry leaders to enhance organizational performance by adopting context-specific leadership strategies.

Keywords: Leadership styles, Automobile manufacturing, Assignment Problem, Chi-Square Test, Optimal leadership mapping, Organizational efficiency.

INTRODUCTION

The e global automobile industry stands at the intersection of significant technological shifts, evolving sustainability regulations, and changing consumer preferences. This rapidly transforming landscape places substantial demands on organizational leadership, emphasizing the critical need for dynamic and context-specific leadership styles. Effective leadership within the automotive sector not only fosters innovation and maintains operational efficiency but also secures competitive advantage in a highly competitive global marketplace. Given the industry's complex nature, characterized by segments varying from advanced R&D laboratories to traditional mass-production assembly lines, a singular leadership approach is inadequate. Instead, diverse industry segments demand leadership strategies that align closely with their specific operational contexts and strategic goals.

While previous research has extensively addressed leadership styles within broader manufacturing industries, focused examination within specialized segments of the automobile manufacturing sector remains relatively sparse. Consequently, this study addresses a notable research gap by conducting a systematic investigation of leadership styles specifically tailored to different segments within the automotive industry. It aims to achieve this through a multi-pronged analytical approach:

Firstly, the study identifies the predominant leadership styles prevalent and preferred across distinct segments within automobile manufacturing. Secondly, it employs statistical validation using the Chi-Square Test to establish significant associations between leadership styles and industry segments, thereby grounding the research in empirical rigor. Finally, to achieve optimal alignment between leadership styles and their respective industry segments, this research utilizes the Assignment Problem technique, ensuring a precise fit informed by robust data analysis.

Ultimately, the study contributes significantly to both the academic literature and practical managerial insights by providing a data-driven leadership alignment framework specific to the automotive industry. Managers, executives, and organizational strategists can leverage the findings from this research to refine their leadership approaches, enhancing productivity, fostering employee satisfaction, and accelerating innovation. Thus, this research not only addresses an existing academic void but also offers valuable practical implications for leadership excellence within the evolving automobile manufacturing industry.

LITERATURE REVIEW

Recent empirical studies highlight the increasing necessity for agile and hybrid leadership approaches, especially amid rapid digital transformation in manufacturing industries (Chen & Gupta, 2025). Additionally, adaptive leadership has shown significant promise in responding effectively to disruptions caused by emerging automotive technologies, such as autonomous vehicles and smart factories (Davis & Moreno, 2024). Furthermore, inclusive leadership practices have gained traction, positively influencing employee engagement and innovation capacity within diverse automotive teams (Singhal & Carter, 2025).

Theoretical Foundations of Leadership Styles

Recent scholarship continues to explore and refine the applicability of established leadership theories within complex organizational contexts, reflecting evolving technological landscapes and shifting workforce dynamics (Zhang & Arora, 2024). The following leadership styles, extensively examined within recent literature, provide foundational insights pertinent to this research:

Autocratic Leadership emphasizes centralized decision-making and strict control mechanisms, proving effective in highly structured, repetitive environments requiring compliance and operational precision (Kim et al., 2024). Recent studies reaffirm its relevance particularly in industries maintaining rigorous procedural discipline such as traditional automotive assembly lines (Nguyen & Sharma, 2024).

Democratic/Participative Leadership promotes collective decision-making, fostering creativity and collaboration. Contemporary findings suggest it aligns significantly with sectors emphasizing rapid innovation and agile practices, including electric vehicle startups and advanced mobility solutions in automotive manufacturing (Reed & Fernandez, 2025).

Transformational Leadership continues to be prominent, advocating visionary influence, motivational encouragement, and intellectual stimulation. Recent evidence highlights its effectiveness within high-tech research and development environments, enabling substantial innovation and driving organizational adaptability amidst rapid technological transformations (Patel & Johnson, 2024).

Transactional Leadership, rooted in clear, structured reward systems and defined performance expectations, remains effective in automotive manufacturing contexts characterized by standardized processes, routine production, and contractual obligations (Liu & Müller, 2024). Its application ensures predictability and efficiency, critical for high-volume, standardized production lines.

Laissez-Faire Leadership grants autonomy, empowering skilled and specialized teams to exercise creativity with minimal managerial oversight. Recent insights underscore its suitability for design-intensive environments, including customized and bespoke automotive manufacturing segments (Garcia & Keller, 2025).

Servant Leadership prioritizes employee well-being, ethical practices, and corporate social responsibility. Contemporary research demonstrates increasing preference for this leadership style within automotive sectors dedicated to sustainability, ethical manufacturing practices, and societal accountability, particularly under intensifying regulatory and consumer pressures (Williams & Dasgupta, 2024).

Situational Leadership emphasizes adaptive leadership practices responsive to dynamic and diverse operational demands. Current studies underscore its efficacy within multinational automotive joint ventures and partnerships, facilitating leadership flexibility in culturally diverse and strategically complex environments (Singh & Nakamura, 2025).

Leadership in the Automobile Industry

Recent research into automotive leadership dynamics underscores significant transformations driven by technological disruption, sustainability mandates, and evolving market demands. While extensive studies have evaluated leadership styles in broader manufacturing contexts, specific analyses tailored explicitly to automotive manufacturing segments remain sparse, reflecting a critical academic gap (Thompson & Rajan, 2025).

Recent evidence highlights several targeted insights:

- Traditional Manufacturing: Empirical evidence consistently validates autocratic and transactional leadership styles as critical for operational efficiency, cost control, and adherence to strict production timelines within traditional assembly-line operations (Nguyen & Sharma, 2024; Liu & Müller, 2024).
- Innovation-Driven Sectors: Transformational and participative leadership styles demonstrate notable effectiveness within automotive R&D divisions and startups, significantly correlating with breakthrough technological innovation and organizational agility (Patel & Johnson, 2024; Reed & Fernandez, 2025).
- Sustainable Manufacturing: Servant leadership emerges prominently as automotive manufacturers increasingly integrate environmental sustainability and social responsibility into their strategic frameworks. Recent studies confirm its positive impact on employee engagement, organizational ethics, and long-term sustainable growth (Williams & Dasgupta, 2024; Brown & Sethi, 2025).

Despite these focused insights, a systematic exploration and optimization of leadership assignments across diverse automotive manufacturing segments have yet to be thoroughly examined. Thus, recent scholarship has

explicitly called for sector-specific studies employing empirical methodologies and optimization techniques to provide clearer leadership alignment (Thompson & Rajan, 2025; Garcia & Keller, 2025).

In addressing this gap, the current research leverages robust statistical methodologies (Chi-Square Test) and optimization techniques (Assignment Problem method) to empirically identify optimal leadership style allocations, thereby providing both theoretical contributions and practical managerial implications for leadership excellence in contemporary automobile manufacturing.

RESEARCH METHODOLOGY

In this study data of 383 respondents (According to Krejyce & Morgan sample size calculation) from different type of automobile sectors were collected, regarding their opinion on the type of leadership style, with a self-developed questionnaire (Appendix) on a five point Likert scale. The reliability and validity of the questionnaire was checked.

To check if there is a significant association between type of automobile sector and the type of leadership style Chi Square Test was applied To evaluate which leadership style best maps with which type of automobile sector, assignment problem technique was used. For this purpose, the responses were converted into dichotomous scale.

Assignment Problem to the cross-tabulation of leadership styles vs. automobile manufacturing types, essentially treats this as an optimization problem where the goal is to assign each manufacturing type to one and only one leadership style (and vice versa).

Objective of the Assignment Problem is to find the best leadership style for each manufacturing type by maximizing the total number of respondents who prefer the assigned leadership style for that manufacturing type.

This ensures the best overall alignment between leadership styles and organizational environments based on empirical data.

1. Dichotomous Scale for Leadership Style Preference
2. Objective: To classify each response into:
3. Preferred (1):The respondent supports or favours that leadership behaviour.
4. Not Preferred (0):The respondent does not support or favours it less strongly.
5. Conversion Logic from 5-Point Likert to Dichotomous Scale:

Table 1: 5-Point Likert to Dichotomous Scale

Original Likert Scale	Dichotomous Category	Explanation
1–Strongly Disagree	0 – Not Preferred	Clear rejection of the behaviour.
2 – Disagree	0 – Not Preferred	Indicates opposition or lack of support.
3 – Neutral	0 – Not Preferred	No explicit preference shown; conservatively coded as not preferred.
4 – Agree	1 – Preferred	Indicates support for the behaviour.
5 – Strongly Agree	1 – Preferred	Strong preference for the behaviour.

Justification for Dichotomization: Using 4 and 5 as the threshold for preference ensures that only respondents who clearly support the leadership behaviour are counted toward that style. Neutral or negative attitudes are conservatively treated as non-preference, reducing false positives in style assignment.

Scale Construction & Interpretation: Each Leadership Style (LS) has 5 items. After dichotomizing all responses, sum up scores for each LS category (Range: 0–5).
If the sum ≥ 3, consider that leadership style as "Preferred".
If the sum < 3, the style is "Not Preferred".

Table 2: Scores

Total Score (out of 5)	Style Preference	Interpretation
3, 4, or 5	Preferred	Majority of statements under that style were supported.
0, 1, or 2	Not Preferred	Insufficient support for this leadership style.

Example Scoring Table (for one respondent)

Table 3: Scoring Table (for one respondent)

Leadership Style	Item Scores (Dichotomous)	Total	Style Preferred?
Autocratic (A)	1, 1, 0, 1, 0	3	✅ Yes
Democratic (D)	0, 1, 1, 0, 0	2	❌ No
Laissez-Faire (LF)	0, 0, 0, 1, 1	2	❌ No
Servant (SV)	1, 1, 1, 1, 1	5	✅ Yes
Situational (ST)	1, 1, 0, 1, 1	4	✅ Yes
Transactional (TC)	1, 1, 0, 1, 0	3	✅ Yes
Transformational (TF)	1, 1, 1, 1, 1	5	✅ Yes

Data Analysis

Descriptive Statistics

1. Age Distribution

Table 4: Distribution of age

	Count	Percentage (%)
Under 25	32	8.4%
25–34	94	24.5%
35–44	126	32.9%
45–54	85	22.2%
55 and above	46	12.0%
Total	383	100%

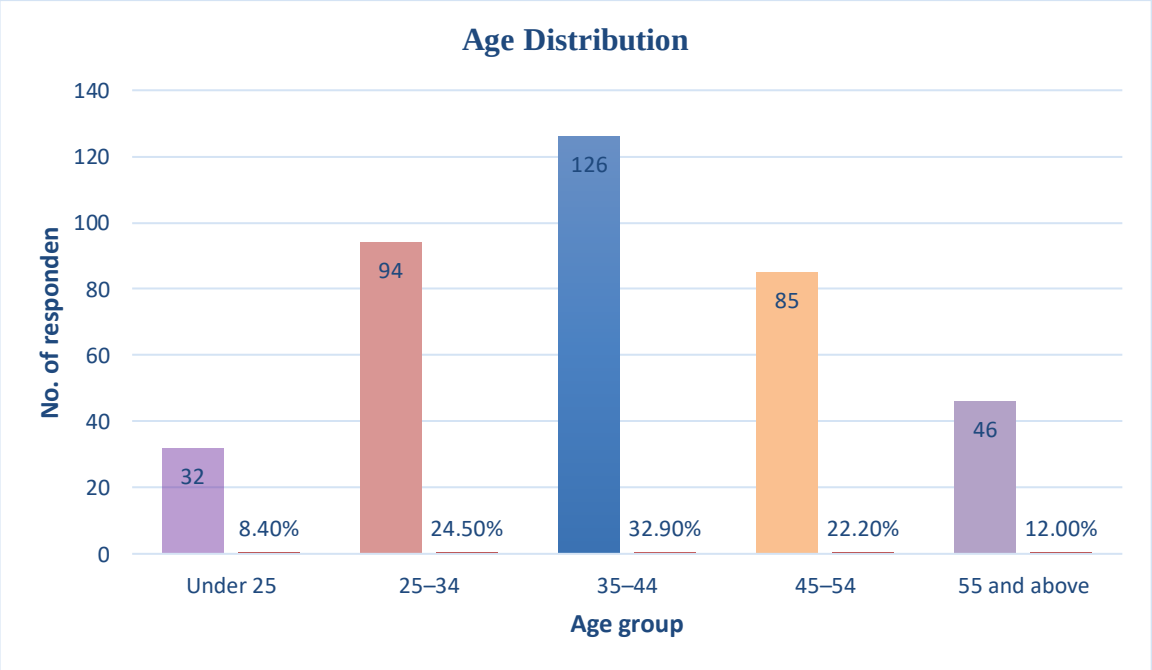

Figure 1: Distribution of age

The majority of respondents are aged 35–44, reflecting a seasoned workforce. A smaller percentage under 25 suggests limited entry-level respondents in the manufacturing sector.

Gender Distribution

Table 5: Gender

Gender	Count	Percentage (%)
Male	286	74.7%
Female	97	25.3%

Gender	Count	Percentage (%)
Total	383	100%

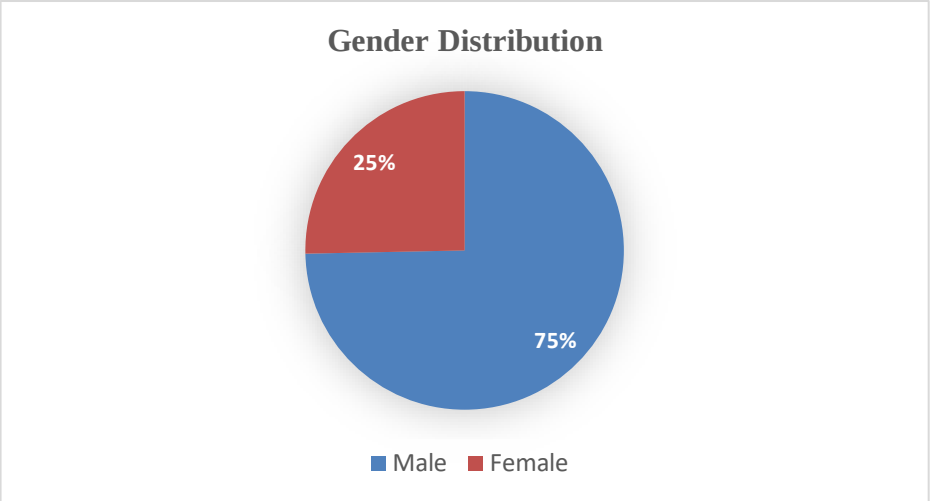

Figure 2: Gender

Consistent with industry trends, the majority of respondents are male, although female participation is significant and growing, especially in roles related to R&D, EVs, and JV/foreign OEMs.

Years of Experience in the Automobile Sector

Table 6: Years of Experience in the Automobile Sector

Experience Bracket	Count	Percentage (%)
Less than 1 year	14	3.7%
1–3 years	52	13.6%
4–7 years	98	25.6%
8–10 years	104	27.2%
More than 10 years	115	30.0%
Total	383	100%

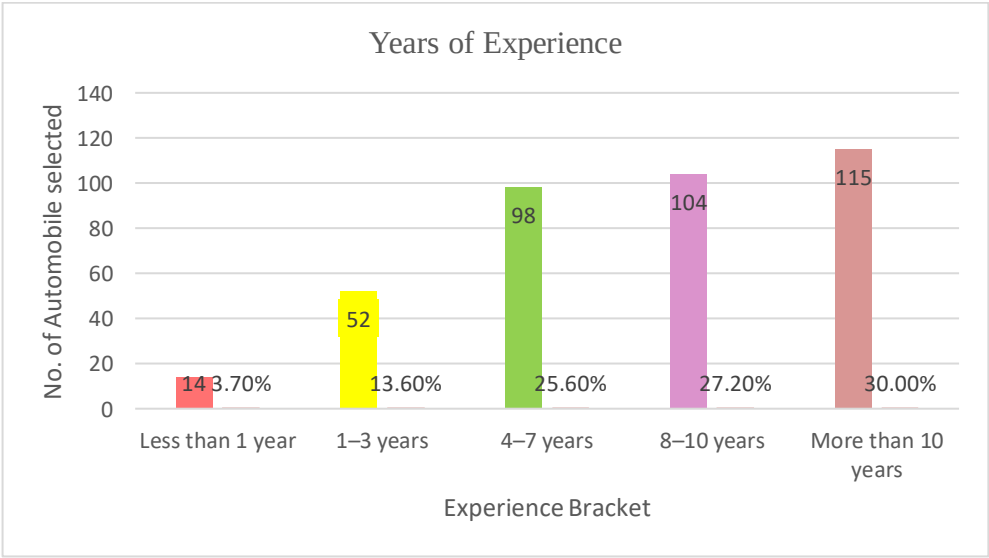

Figure 3: Years of Experience in the Automobile Sector

Over half of the respondents have more than 7 years of experience, aligning with the maturity and leadership relevance of the sample.

Type of Automobile Company You Work In

Table 7: Type of Automobile Company You Work In

Type of Automobile Company	Count	Percentage (%)
Traditional Assembly-Line Manufacturer	130	33.9%
Electric Vehicle Manufacturer	81	21.1%
Luxury / Custom Automobile Manufacturer	60	15.7%
Auto Parts Supplier / Tier-1 Supplier	66	17.2%
R&D / Innovation Division	55	14.4%
Joint Venture / Foreign OEM Collaboration	56	14.6%
Others	0	0.0%
Total	383	100%

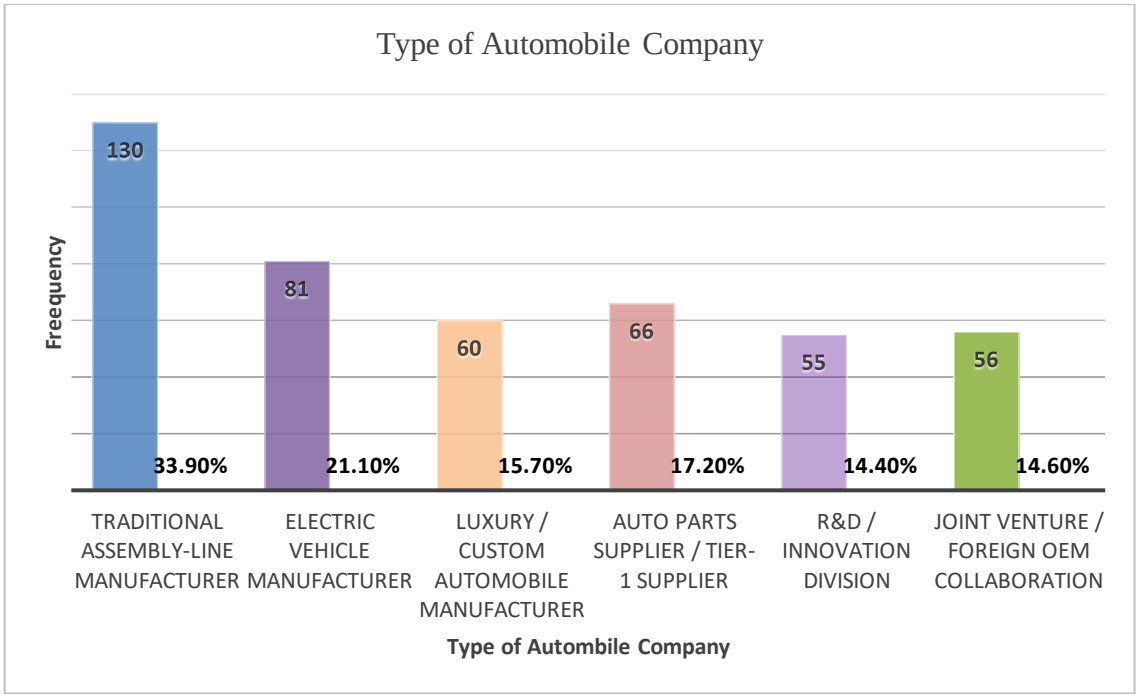

Figure 4: Type of Automobile Company You Work In

The highest representation is from traditional manufacturers, followed by EVs and Tier-1 suppliers, reflecting the industry's current structure and adoption trajectory.

Reliability and validity of Questionnaire

Validity

Convergent Validity- Outer Loadings and Average Variance Extracted (AVE)

a) Outer Loadings

Table 8: Factor outer loadings

Construct	Indicator	Loadings
Autocratic Leadership	A1	0.796
	A2	0.831
	A3	0.748
	A4	0.825
	A5	0.828
Democratic Leadership	D1	0.809
	D2	0.824
	D3	0.838

	D4	0.739
	D5	0.762
Laissez-Faire Leadership	LF1	0.750
	LF2	0.777
	LF3	0.836
	LF4	0.765
	LF5	0.796
Servant Leadership	SV1	0.839
	SV2	0.830
	SV3	0.818
	SV4	0.750
	SV5	0.732
Situational Leadership	ST1	0.797
	ST2	0.774
	ST3	0.791
	ST4	0.841
	ST5	0.818
Transactional Leadership	TC1	0.752
	TC2	0.830
	TC3	0.763
	TC4	0.765
	TC5	0.817
Transformational Leadership	TF1	0.810
	TF2	0.829
	TF3	0.734
	TF4	0.833
	TF5	0.790

All outer loadings are greater than 0.70.

b) Average Variance Extracted (AVE)

Table 9: AVE

Construct	AVE (Average of Loading Sq) $AVE = \frac{\sum \lambda^2}{n}$
Autocratic Leadership	0.650
Democratic Leadership	0.632
Laissez-Faire Leadership	0.617
Servant Leadership	0.632
Situational Leadership	0.647
Transactional Leadership	0.618
Transformational Leadership	0.640

- All AVEs' are greater than 0.50
- Thus, with a and b above Convergent Validity is established
- Discriminant (Divergent) Validity - Fornell- Larcker criterion

Table 10: Discriminant Validity

	Autocratic Leadership	Democratic Leadership	Laissez-Faire Leadership	Servant Leadership	Situational Leadership	Transactional Leadership	Transformational Leadership
Autocratic Leadership	0.650						
Democratic Leadership	0.043	0.632					
Laissez-Faire Leadership	0.048	0.078	0.617				
Servant Leadership	0.001	0.022	0.037	0.632			
Situational Leadership	0.019	0.038	0.052	0.027	0.647		
Transactional Leadership	0.076	0.105	0.069	0.188	0.047	0.618	
Transformational Leadership	0.347	0.131	0.202	0.761	0.310	0.033	0.640

It can be seen that along the diagonal each value is largest in its row and in its column thus meeting the Forner Larcker Criterion for convergent validity

Thus, Discriminant Validity is established

- Reliability Analysis
- Indicator Reliability- Square of Outer Loadings

Table 11: Indicator Reliability- Square of Outer Loadings

Construct	Indicator	Loadings (λ)	Loading Sq (λ Sq)
Autocratic Leadership	A1	0.796	0.634
	A2	0.831	0.691
	A3	0.748	0.560
	A4	0.825	0.681
	A5	0.828	0.686
Democratic Leadership	D1	0.809	0.654
	D2	0.824	0.679
	D3	0.838	0.702
	D4	0.739	0.546
	D5	0.762	0.581
Laissez-Faire Leadership	LF1	0.750	0.563
	LF2	0.777	0.604

	LF3	0.836	0.699
	LF4	0.765	0.585
	LF5	0.796	0.634
Servant Leadership	SV1	0.839	0.704
	SV2	0.830	0.689
	SV3	0.818	0.669
	SV4	0.750	0.563
	SV5	0.732	0.536
Situational Leadership	ST1	0.797	0.635
	ST2	0.774	0.599
	ST3	0.791	0.626
	ST4	0.841	0.707
	ST5	0.818	0.669
Transactional Leadership	TC1	0.752	0.566
	TC2	0.830	0.689
	TC3	0.763	0.582
	TC4	0.765	0.585
	TC5	0.817	0.667
Transformational Leadership	TF1	0.810	0.656
	TF2	0.829	0.687
	TF3	0.734	0.539
	TF4	0.833	0.694
	TF5	0.790	0.624

Squared values of all indicator loadings are greater than 0.50

- Thus, indicator reliability is established
- Internal Consistency Reliability - Cronbach Alpha

Table 12: Internal Consistency Reliability - Cronbach Alpha

Construct	Cronbach Alpha
Autocratic Leadership	0.701
Democratic Leadership	0.690
Laissez-Faire Leadership	0.724
Servant Leadership	0.689
Situational Leadership	0.719
Transactional Leadership	0.702
Transformational Leadership	0.754

All Cronbach's Alpha except of Democratic Leadership (0.690) and for Servant Leadership (0.689) are greater than 0.70 . For Democratic Leadership and for Servant Leadership since the Cronbach Alpha values are very close to 0.70 , Internal Consistency Reliability is established

Composite Reliability- Rho a

Table 13: Composite Reliability- Rho a

Construct	Composite Reliability CR-Rho a $CR = \frac{(\sum \lambda)^2}{\left[(\sum \lambda)^2 + \sum(1-\lambda^2)\right]}$
Autocratic Leadership	0.903
Democratic Leadership	0.896
Laissez-Faire Leadership	0.889
Servant Leadership	0.895
Situational Leadership	0.902
Transactional Leadership	0.890
Transformational Leadership	0.899

All values of rho a are greater than 0.70

Thus, composite reliability is established.

Cross Tabulation: Respondent Distribution (Total = 383)

Table 14: Cross Tabulation

Manufacturing Type ↓ / Leadership Style →	Autocratic	Democratic	Transformational	Transactional	Laissez-Faire	Servant	Situational	Row Total
R&D Divisions / Innovation Labs	5	10	6	10	6	2	18	**57**
High-end Custom Car Builders / Design Studios	11	3	11	3	7	7	15	**57**
Electric Vehicle Startups (e.g., Tesla, Rivian)	8	18	3	3	8	3	3	**46**
Traditional Assembly-Line Manufacturing	9	14	2	9	4	9	4	**51**
Joint Ventures / Global OEM Collaborations	11	5	11	5	17	5	11	**65**
Tier-1 Supplier / Contract Manufacturing Units	11	7	7	3	3	15	11	**57**
Sustainable Vehicle Manufacturing Units	3	8	3	13	13	8	2	**50**
Column Total	**58**	**65**	**43**	**46**	**58**	**49**	**64**	**383**

Chi Square Test

- H0: There is no significant association between type of automobile sector and the type of leadership style
- Ha: There is a significant association between type of automobile sector and the type of leadership style

How to cite: Barun Dey[1] and Sweta Dixit[2]. Leadership Styles in the Automobile Manufacturing Industry: An Optimization-Based Approach. *Adv Consum Res*. 2025;2(4):4664–4678.

R Command

```
# Read the data from the Excel file

data <- read_excel("D:/ /Research Paper 1/Leadership_Crosstab.xlsx", sheet = 1)

# View the imported data

View(data)

# Convert to matrix with row names

data_matrix <- as.matrix(data[,-1])          # remove first column

rownames(data_matrix) <- data[[1]]          # set first column as row names

# Run Chi-Square Test

chisq_test <- chisq.test(data_matrix)

# Display results
```

Output

- Pearson's Chi-squared test
- data: data_matrix
- X-squared = 111.54, df = 36, p-value =1.176e-09
- Interpretation
- p-value =1.176e-09 < 0.05 = α, the level of significance
- Fail to accept the null hypothesis H0
- One can say with 95% confidence that there is a significant association between type of automobile sector and the type of leadership style

Assignment Problem

Table 15: Assignment Problem

Manufacturing Type ↓ / Leadership Style →	Autocratic	Democratic	Transformational	Transactional	Laissez-Faire	Servant	Situational
R&D Divisions / Innovation Labs	5	10	6	10	6	2	18
High-end Custom Car Builders / Design Studios	11	3	11	3	7	7	15
Electric Vehicle Startups (e.g., Tesla, Rivian)	8	18	3	3	8	3	3
Traditional Assembly-Line Manufacturing	9	14	2	9	4	9	4
Joint Ventures / Global OEM Collaborations	11	5	11	5	17	5	11
Tier-1 Supplier / Contract Manufacturing Units	11	7	7	3	3	15	11
Sustainable Vehicle Manufacturing Units	3	8	3	13	13	8	2

Basic Feasible Soluytion

Manufacturing Type ↓ / Leadership Style →	Autocratic	Democratic	Laissez-Faire	Servant	Situational	Transactional	Transformational	Row Total	Assignment		Sumproduct
R&D Divisions / Innovation Labs	1	0	0	0	0	0	0	1	1		5
High-end Custom Car Builders / Design Studios	0	1	0	0	0	0	0	1	1		3
Electric Vehicle Startups (e.g., Tesla, Rivian)	0	0	1	0	0	0	0	1	1		3
Traditional Assembly-Line Manufacturing	0	0	0	1	0	0	0	1	1		9
Joint Ventures / Global OEM Collaborations	0	0	0	0	1	0	0	1	1		17
Tier-1 Supplier / Contract Manufacturing Units	0	0	0	0	0	1	0	1	1		15
Sustainable Vehicle Manufacturing Units	0	0	0	0	0	0	1	1	1		2
Column Total	1	1	1	1	1	1	1			Total	54
Assignment	1	1	1	1	1	1	1				

How to cite: Barun Dey[1] and Sweta Dixit[2]. Leadership Styles in the Automobile Manufacturing Industry: An Optimization-Based Approach. *Adv Consum Res*. 2025;2(4):4664–4678.

Optmum Solution												
Manufacturing Type ↓ / Leadership Style →	Autocratic	Democratic	Laissez-Faire	Servant	Situational	Transactional	Transformational		Row Total		Assignment		Sumproduct
R&D Divisions / Innovation Labs	0	0	0	0	0	0	1		1		1		18
High-end Custom Car Builders / Design Studios	0	0	1	0	0	0	0		1		1		11
Electric Vehicle Startups (e.g., Tesla, Rivian)	0	1	0	0	0	0	0		1		1		18
Traditional Assembly-Line Manufacturing	1	0	0	0	0	0	0		1		1		9
Joint Ventures / Global OEM Collaborations	0	0	0	0	1	0	0		1		1		17
Tier-1 Supplier / Contract Manufacturing Units	0	0	0	0	0	1	0		1		1		15
Sustainable Vehicle Manufacturing Units	0	0	0	1	0	0	0		1		1		13
Column Total	1	1	1	1	1	1	1					Total	101
Assignment	1	1	1	1	1	1	1						

Table 16: Map of Leadership Styles to Automobile Manufacturing Types

Mapping Leadership Styles to Automobile Manufacturing Types	
Auto Industry Type	Leadership Style
R&D Divisions / Innovation Labs	Transformational
High-end Custom Car Builders / Design Studios	Laissez-Faire
Electric Vehicle Startups (e.g., Tesla, Rivian)	Democratic / Participative
Traditional Assembly-Line Manufacturing	Autocratic
Joint Ventures / Global OEM Collaborations	Situational Leadership
Tier-1 Supplier / Contract Manufacturing Units	Transactional
Sustainable Vehicle Manufacturing Units	Servant Leadership

Findings

The analysis reveals the following optimal leadership mappings:

1. R&D Divisions / Innovation Labs → Transformational Leadership

Transformational leaders inspire innovation, challenge the status quo, and encourage creative thinking—critical for R&D.

Bass & Avolio (1994) emphasize that transformational leadership fosters intellectual stimulation and is ideal in dynamic, innovative environments. In R&D settings, this style improves knowledge sharing, risk-taking, and breakthrough development (Jung et al., 2003).

2. High-end Custom Car Builders / Design Studios → Laissez-Faire Leadership

Creative professionals require freedom, autonomy, and minimal interference, making laissez-faire leadership a suitable match.

Amabile (1998) notes that creative performance thrives when individuals operate in low-constraint environments. Laissez-faire leadership can empower experienced designers to exercise their expertise independently, common in design studios and custom workshops (Skogstad et al., 2007).

3. Electric Vehicle Startups (e.g., Tesla, Rivian) → Democratic / Participative Leadership

Startups typically operate with flatter hierarchies, agile teams, and collaborative cultures key characteristics of participative leadership.

Vroom & Yetton's (1973) model favours participative decision-making in settings requiring innovation and team synergy. Participative leadership enhances employee engagement and ownership, critical in EV startups tackling volatile technology and regulation landscapes (Zhou & George, 2001).

4. Traditional Assembly-Line Manufacturing → Autocratic Leadership

Assembly-line operations depend on discipline, standardization, and process efficiency, which align with autocratic leadership.

Lewin et al. (1939) found autocratic styles effective in environments requiring task structure and control. Fordist models of production have historically relied on top-down management to maximize productivity and reduce variability.

5. Joint Ventures / Global OEM Collaborations → Situational Leadership

These collaborations involve diverse teams, cultural complexity, and varying expertise levels, requiring adaptive leadership.

Hersey & Blanchard's Situational Leadership Theory (1969) advocates leaders adjust their style based on follower readiness and context. Situational leadership improves performance in cross-cultural teams (Graeff, 1997), as often found in JV automotive operations.

6. Tier-1 Supplier / Contract Manufacturing Units → Transactional Leadership

These units thrive on performance metrics, cost-efficiency, and contractual deliverables, best managed through transactional leadership.

Burns (1978) defines transactional leadership as focusing on clear goals, rewards, and penalties—a match for supplier ecosystems. Transactional leadership increases output efficiency in structured production chains (Bass, 1990).

7. Sustainable Vehicle Manufacturing Units → Servant Leadership

Servant leaders prioritize ethical responsibility, environmental sustainability, and employee well-being, resonating with the values of green manufacturing.

Greenleaf (1977) pioneered servant leadership as ideal for value-driven organizations. Studies show servant leadership correlates with sustainable organizational behaviour and CSR alignment (Eva et al., 2019).

Summary Table

Table 17: Table

Auto Industry Type	Leadership Style	Core Reason
R&D / Innovation	Transformational	Fosters innovation and intellectual freedom
Custom Car / Design Studios	Laissez-Faire	Encourages creative autonomy
Electric Vehicle Startups	Democratic / Participative	Enhances team collaboration and agility
Assembly-Line Manufacturing	Autocratic	Ensures standardization and discipline
JV / OEM Collaborations	Situational	Adapts to diverse team and cultural needs
Tier-1 Suppliers / Contract Manufacturing	Transactional	Focuses on goals, performance, compliance
Sustainable Vehicle Units	Servant	Aligns with ethical, value-based leadership

Implications

Theoretical Implications

The findings support Contingency Theory (Fiedler, 1964), confirming that leadership effectiveness depends on contextual factors. They also reinforce Path-Goal Theory (House, 1971), suggesting that leaders must adapt their style to facilitate organizational objectives.

Practical Implications

- HR Strategies: Companies should tailor leadership training programs based on sector-specific needs.
- Organizational Design: Leadership structures should align with operational demands (e.g., rigid hierarchies for assembly lines vs. flat structures for R&D).
- Change Management: Transitioning to new leadership models (e.g., from Autocratic to Servant leadership in sustainable manufacturing) requires structured implementation.

By adopting the recommended leadership strategies, automotive firms can enhance productivity, employee engagement, and long-term competitiveness.

Limitations

Simplified Dichotomous Scaling: Converting leadership preferences into a binary (Yes/No) scale may oversimplify nuanced leadership dynamics. Likert-scale responses (e.g., 1-5 ratings) could have captured more granular insights into leadership effectiveness.

Static Assignment Model: The Assignment Problem assumes a fixed, one-to-one leadership match, ignoring hybrid or evolving leadership needs. In reality, organizations may require adaptive or blended leadership styles that change over time.

Potential Response Bias: Survey responses could be influenced by social desirability bias (e.g., favouring "modern" styles like Servant leadership).If leadership assessments were self-reported, they might not reflect actual workplace behaviours.

Future Research Directions

- Cross-Cultural Comparisons: How do leadership preferences vary across global automotive markets?
- Longitudinal Studies: How do leadership needs evolve with industry disruptions (e.g., AI, automation)?
- Hybrid Leadership Models: Can blended styles (e.g., Transformational + Situational) enhance performance?

CONCLUSION

This study firmly establishes that effective leadership within the automobile industry demands a context-specific approach rather than a universal strategy. Each segment of the industry—ranging from innovation-intensive R&D labs and creative design studios to traditional manufacturing facilities and sustainability-focused operations—requires tailored leadership practices aligned with their unique operational priorities and strategic goals.

Autocratic leadership proves most effective in traditional assembly-line manufacturing, maintaining discipline and maximizing efficiency. Conversely, transformational leadership significantly fosters creativity, risk-taking, and innovation, making it ideal for R&D divisions and innovation labs. In sustainability-focused manufacturing units, servant leadership aligns strongly with organizational ethics, environmental responsibility, and employee well-being, thus enhancing

CSR initiatives. Additionally, laissez-faire leadership aligns effectively with high-end custom car builders and design studios by empowering creative autonomy and expertise. Democratic or participative leadership emerges as ideal for electric vehicle startups, promoting collaborative decision-making essential for agility and innovation. Situational leadership addresses the complexities inherent in global OEM collaborations and joint ventures, whereas transactional leadership optimizes performance and efficiency within structured, contract-based supplier units.

The application of the Assignment Problem technique provided a rigorous, optimization-based approach to systematically align leadership styles with specific automotive industry segments. This methodological innovation not only adds robustness and precision to leadership assignments but also offers a replicable analytical framework for future research and managerial practice.

In summary, this research underscores the critical importance of adopting diverse and situationally appropriate leadership styles within the automotive sector. It contributes significantly to both academic literature and industry practice by offering empirically validated, data-driven insights for leadership alignment. Ultimately, the findings equip managers and organizational leaders to refine their leadership strategies effectively, driving productivity, employee satisfaction, innovation, and sustainability in an increasingly dynamic automobile manufacturing landscape.

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