Optimizing Workforce Strategies: HR Analytics for Enhancing Dealer Performance in the Automobile Retail Industry

Abstract:

Purpose

This study aims to leverage HR analytics to optimize workforce strategies in the automobile retail industry, focusing on enhancing dealership performance. The objective is to align human resource management practices with dealership metrics such as sales performance, customer satisfaction, and operational efficiency. From the dealership's perspective, receiving structured support from manufacturers in workforce planning, training, and incentives can lead to improved performance, higher customer satisfaction, and increased profitability.

Design/methodology/approach

The study begins by identifying challenges in workforce management within dealerships, such as inconsistent performance and skill gaps. A structured methodology is employed, combining workforce segmentation, predictive modelling, and the SERVQUAL framework to evaluate service quality. Techniques such as machine learning-based clustering and regression are used to analyze dealership performance metrics and workforce data. The insights are presented using interactive dashboards built in Power BI, providing actionable recommendations for HR policies and dealership strategies.

Expected Findings

The study is expected to reveal that dealerships can significantly benefit from tailored support provided by manufacturers, including standardized training programs, strategic workforce allocation, and reward systems. With these interventions, dealerships experience improved operational efficiency, higher employee satisfaction, and better alignment with customer expectations. From the dealership perspective, consistent manufacturer support fosters stronger employee engagement, leading to sustained sales growth and enhanced service quality.

Practical implications

Integrating HR analytics with dealership operations enables data-driven decision-making that enhances workforce productivity and dealership outcomes. Manufacturers, by offering structured HR support, can ensure consistent dealership quality and improved brand representation, while dealerships benefit from reduced skill gaps, streamlined operations, and higher profitability.

Social implications:

Optimizing HR practices in dealerships enhances job satisfaction, skill development, and employee retention. This creates a more engaged workforce, positively impacting community well-being and service delivery standards.

Originality/value

This research presents a unique framework for integrating HR analytics in the automobile retail industry, emphasizing the dealership perspective. It demonstrates how structured manufacturer support, combined with data-driven HR strategies, can improve dealership performance, align

workforce practices with business goals, and achieve competitive advantage in a rapidly evolving market.

Keywords:

HR Analytics, Workforce Optimization, Dealership Performance, Sales Performance, Customer Satisfaction, Service Quality, Predictive Modelling

Introduction

The automotive retail industry plays a pivotal role in the overall success of automobile manufacturers, as dealerships are the primary interface between the brand and the end consumer. For dealerships to thrive in a competitive market, it is essential to not only focus on product offerings but also optimize workforce strategies. Effective human resource management (HRM) within dealerships is a key driver of operational performance, customer satisfaction, and long-term profitability. However, workforce management in dealerships faces several challenges, including inconsistent employee performance, skill gaps, and misalignment between dealership operations and customer expectations.

In recent years, HR analytics has emerged as a powerful tool for overcoming these challenges. By leveraging data-driven insights, HR analytics enables the optimization of workforce strategies, improving employee engagement, satisfaction, and productivity. It helps align HR practices with key dealership metrics such as sales performance, customer satisfaction, and operational efficiency. Moreover, structured support from automobile manufacturers in areas such as workforce planning, training, and incentives can significantly enhance dealership performance, resulting in improved operational outcomes and enhanced customer service.

This study aims to explore how HR analytics can be integrated into the workforce management strategies of automobile dealerships to improve performance and efficiency. The research utilizes a structured methodology that combines workforce segmentation, predictive modelling, and service quality assessment using the SERVQUAL framework. Through advanced data analysis techniques such as machine learning-based clustering and regression, the study seeks to identify actionable insights that can guide HR policies and dealership strategies. Additionally, the insights will be presented through interactive dashboards, enabling decision-makers to visualize key performance indicators and make informed, data-driven decisions.

Ultimately, this research strives to demonstrate how a data-centric approach to HRM, supported by tailored manufacturer interventions, can optimize workforce allocation, reduce skill gaps, and enhance overall dealership performance. By aligning human resource practices with business goals, this study offers a pathway for dealerships to achieve sustained sales growth, improved service quality, and a competitive edge in the automotive market.

Hypothesis Statements

Null Hypothesis (H_0):

There is no significant relationship between HR strategies, such as training investments, reward systems, and workforce allocation, and the performance metrics of automobile dealerships (e.g., sales performance, customer satisfaction, and employee retention).

Alternative Hypothesis (H_1):

There is a significant relationship between HR strategies, such as training investments, reward systems, and workforce allocation, and the performance metrics of automobile dealerships (e.g., sales performance, customer satisfaction, and employee retention).

Null Hypothesis (H_0):

Support from manufacturers, such as providing standardized training programs and strategic HR policies, does not significantly improve dealership outcomes like employee satisfaction, operational efficiency, and customer service quality.

Alternative Hypothesis (H_1):

Support from manufacturers, such as providing standardized training programs and strategic HR policies, significantly improves dealership outcomes like employee satisfaction, operational efficiency, and customer service quality.

Null Hypothesis (H_0):

Implementing predictive HR analytics does not significantly enhance the alignment of workforce strategies with dealership performance and market demands.

Alternative Hypothesis (H_1):

Implementing predictive HR analytics significantly enhances the alignment of workforce strategies with dealership performance and market demands.

literature survey

The field of research encompassing consumer satisfaction, workforce optimization, technological disruptions, and innovation in the automotive and associated industries has been extensively explored in recent studies. Rehman et al. [1] investigated the role of consumer satisfaction in driving brand allegiance in Pakistan's automobile sector, emphasizing the importance of customer expectations, perceived quality, and CRM strategies. Ruiz et al. [2] examined the impact of digital human resource strategies on firm performance, showcasing the integration of digital technologies in HR practices to drive organizational success. AlDosiry et al. [3] analyzed emotional intelligence (EI) and its correlation with sales performance in Kuwait's automotive sector, finding weak links between EI and sales outcomes. Latorre et al. [4] proposed a prescriptive analytics framework to optimize employee turnover using benefits

such as transportation systems, reducing costs and increasing satisfaction. Kim et al. [5] explored the disruptions caused by CASE technologies in automotive retail, using systems thinking methodologies to identify strategic opportunities in the South Korean market. Njoku et al. [6] evaluated regression techniques for analyzing service advisor performance in dealerships, highlighting the importance of explainable AI for operational and customer satisfaction. This aligns with McIver et al. [14], who introduced an agile workforce analytics process integrating data-driven insights to enhance decision-making and operational efficiency in HR and dealership contexts. Jayarathna et al. [7] provided insights into strategic HR management's role in aligning practices with organizational goals, emphasizing ethical practices and emerging trends. This could be linked with Madhani [37], which also emphasizes the strategic use of HR analytics for organizational performance. James et al. [8] identified challenges in implementing Industry 4.0 in the Indian automotive sector, offering solutions to address skill gaps and employee adaptation issues.

Chen et al. [9] analyzed the influence of physical and mental workloads on employee safety behavior in the automobile industry, highlighting interventions like job rotation to improve workplace safety. Sachdeva et al. [10] utilized Twitter analytics to examine customer value co-creation in the automotive industry, emphasizing the role of participation and citizenship behavior in enhancing brand loyalty. Latin-Kasper [11] proposed methods to calculate potential B2B sales using county business patterns and end-user sales data, providing a model for precise market targeting. Wang and Dong [12] studied performance reward discrepancies' influence on dealer servitization levels, revealing significant correlations between rewards and engagement levels. Lai [13] analyzed influence strategies in Taiwan's motor industry, demonstrating that dealer satisfaction strongly impacts performance through economic and social satisfaction metrics. McIver et al. [14] introduced an agile workforce analytics process to integrate data-driven insights for enhanced decision-making. Luo et al. [15] quantified the impact of radical automotive facelifts on sales, using a Bayesian structural time series model to assess both short-term and long-term effects. Hamieddine et al. [16] explored HR analytics frameworks for improving resource allocation and recruitment strategies. Balinado et al. [17] assessed the SERVQUAL approach's effectiveness in after-sales service, emphasizing reliability and empathy's roles in customer satisfaction. Consider linking this with Sachdeva et al. [10], as both explore customer satisfaction, albeit through different methodologies. Coolen et al. [18] conducted a systematic review of workforce analytics, identifying institutional mechanisms influencing adoption and institutionalization. You might combine this with McIver et al. [14] to provide a broader discussion on workforce analytics adoption and their strategic impact. Almohri et al. [19] evaluated the performance of automotive dealerships using grouped mixture of regressions, highlighting the advantages of clustering for predictive accuracy. Singh et al. [20] integrated aspect-level sentiment analysis with panel data modeling to quantify eWOM's impact on sales, focusing on consumer perceptions of product features.

Hunter and Katz [21] discussed globalization's effects on HR management and employment relations, contrasting practices in the US automobile and banking sectors. Bélis-Bergouignan et al. [22] examined global strategies in the automobile industry, identifying strategic configurations influencing organizational capabilities. Verma and Venkatesan [23] linked

Industry 4.0 innovations to workforce strategies in India, advocating for reskilling and continuous learning. Shvetsova et al. [24] highlighted leadership's role in integrating knowledge management for competitive advantage in the automotive industry. Hashemi-Petroodi et al. [25] addressed workforce and equipment optimization in Industry 5.0 assembly lines, emphasizing flexibility and dynamic planning. Seo and Soh [26] analyzed workforce reductions' effects on firm performance, stressing the importance of aligning downsizing strategies with business goals. Bradley [27] illustrated how compensation strategies foster workforce loyalty and engagement, driving organizational performance. Sharma [28] examined the moderating effects of environmental attitudes on green supply chain practices, linking employee engagement to sustainability. Opata et al. [29] delved into customer value co-creation's dynamics in the Ghanaian automotive market, emphasizing collaborative relationships to enhance satisfaction and loyalty. Na-Nan et al. [30] investigated self-efficacy's impact on organizational citizenship behavior, identifying mediators like employee engagement and job satisfaction. Zhang et al. [31] proposed a C2B customization model for the automotive industry, enhancing customer satisfaction through personalized production strategies. Harel [32] explored COVID-19's impact on small businesses, highlighting resilience strategies that enabled adaptation to economic challenges. Abugre [33] studied HR managers' roles in mergers and acquisitions within Ghana's public sector, emphasizing the need for strategic involvement in policy formulation. Chen et al. [34] introduced fuzzy control methods to improve vehicle cruise systems' roll stability. Yeshanew et al. [35] conducted crashworthiness analysis of 3D-printed carbon polyamide bumpers, demonstrating significant advancements in energy absorption and sustainability. Afolabi et al. [36] highlighted health risks among informal automobile artisans in Nigeria, advocating for improved occupational health programs. Madhani [37] emphasized HR analytics' role in enhancing organizational performance through data-driven strategies. Abdul-Halim et al. [38] examined factors contributing to HR outsourcing success, such as trust and communication. Sharma et al. [39] analyzed employer branding's mediating role in enhancing employee engagement, advocating for integrated HR practices. Boon et al. [40] reviewed HR management systems' measurement, proposing frameworks to refine conceptual clarity. Chiu et al. [41] examined price dispersion's effects on automobile sales, revealing non-linear relationships influencing consumer behavior. Aggarwal [42] addressed challenges in India's automobile industry, highlighting the need for technological investments. Mani [43] studied HR strategies for innovation in India's automotive sector, focusing on R&D capabilities. Wad [44] compared Malaysia and Thailand's automotive industries, emphasizing policy impacts on development trajectories.

Xu et al. [45] compared product and service quality's contributions to customer satisfaction in the automotive industry, favoring product quality as a primary determinant. Allani and Kodama [46] analyzed technological uncertainty's influence on R&D investments in Japan's IT and automotive sectors. Martínez-Jurado et al. [47] explored HRM's critical role in adopting Lean Production, emphasizing leadership and training. Norsworthy and Zabala [48] investigated worker attitudes and productivity in the US automobile industry, identifying socio-economic factors driving engagement. Fava and Gatejel [49] examined East-West cooperation in the automotive industry, focusing on technology transfer and cross-border partnerships. Sonal et al. [50] highlighted human-centric skills' importance in Industry 4.0 transformations. Rana et al. [51] identified antecedents for Industry 4.0 success in the Indian automotive sector,

emphasizing regulatory and technological readiness. Kolter et al. [52] addressed workforce planning challenges in transitioning to electric vehicles, advocating for integrated planning models. Bihlmaier et al. [53] introduced stochastic models for strategic capacity planning in automotive production, showcasing their industrial applicability. Bathaee [54] optimized manpower allocation in dealerships using metaheuristic algorithms, demonstrating efficiency in reducing customer wait times. Zacharatos et al. [55] conducted a meta-analysis of HRM practices' effects on psychosocial outcomes in the North American automotive industry, linking leadership to employee well-being. This could be combined with Sharma et al. [39] to discuss the interplay between leadership, HR practices, and employee engagement. MacDuffie [56] highlighted the integration of HR bundles with manufacturing systems to improve performance in automotive plants. Kameswari et al. [57] leveraged AI for people analytics, identifying key factors influencing employee attrition. Gedam et al. [58] identified success factors for sustainable manufacturing in the automotive sector, emphasizing environmental auditing's role in OHRM strategies. Na-Nan et al. [59] examined self-efficacy's transmission through engagement, commitment, and job satisfaction in Thai automobile parts manufacturing. Gedam et al. [60] further explored sustainable practices, highlighting top management's influence in fostering environmentally conscious organizational cultures.

Objective:

1. To investigate how manufacturer-provided standardized training programs and training investment influence employee satisfaction, employee retention, and sales performance in automobile dealerships.
2. To evaluate how reward systems and workforce allocation strategies collectively influence dealership performance metrics, including sales, customer satisfaction, and employee retention.
3. To assess the role of strategic HR policies supported by manufacturers in enhancing operational efficiency and improving the quality of customer service in dealerships.
4. To assess the effectiveness of predictive HR analytics in aligning workforce strategies with dealership performance and market demands.
5. To identify challenges in workforce management within dealerships, focusing on skill gaps, inconsistent performance, and the need for workforce segmentation.
6. To propose a framework for integrating HR analytics and dealership operations, emphasizing actionable recommendations for workforce planning and strategic alignment.

Methodology:

1. Define the Research Objectives and Hypothesis

- **Objective**: Improve dealer performance through data-driven workforce strategies, focusing on HR-related factors such as employee engagement, training, performance metrics, and turnover.

- **Hypothesis**: HR analytics can positively influence workforce decisions, leading to improved dealer performance through optimized staffing, better training, and enhanced employee retention.

2. Identify Key Performance Indicators (KPIs) for Dealer Performance

- **Sales Performance**: Measure sales revenue, units sold, and conversion rates.
- **Customer Satisfaction**: Evaluate dealer service quality using customer feedback and satisfaction scores.
- **Employee Productivity**: Assess performance metrics such as lead conversion rates, hours worked, and individual sales targets.
- **Employee Engagement**: Use surveys to gauge job satisfaction, motivation, and team dynamics.

3. Data Collection

- **Employee Data**: Collect HR data including demographics (age, gender, experience), performance appraisals, training histories, attendance, turnover rates, and compensation details.
- **Sales Data**: Gather data on sales figures, customer interactions, and lead conversion for dealers.
- **Employee Feedback**: Use surveys or focus groups to collect qualitative insights on employee engagement, team dynamics, and job satisfaction.
- **Customer Feedback**: Collect data from customer surveys, net promoter scores (NPS), and online reviews to assess dealer performance from the customer's perspective.

4. Data Cleaning and Preprocessing

- **Ensure Data Quality**: Remove any incomplete, inconsistent, or erroneous data. Normalize and standardize data formats to ensure consistency.
- **Data Integration**: Combine various datasets (HR, sales, customer feedback) into a centralized data warehouse for analysis.

5. Conduct Descriptive Analytics

- **Demographic Analysis**: Analyze the relationship between employee demographics (age, tenure, role) and performance metrics.
- **Sales Trend Analysis**: Identify patterns in sales performance across different dealers, employee groups, and time periods.
- **Attrition and Retention**: Assess turnover rates and identify any correlation with performance or job satisfaction.

6. Conduct Predictive Analytics

- **Employee Performance Prediction**: Use machine learning algorithms (e.g., regression analysis, decision trees) to predict employee performance based on HR factors like training, tenure, and prior experience.
- **Sales Forecasting**: Build predictive models to forecast sales performance by incorporating employee performance data and external factors (e.g., market trends).
- **Employee Retention Models**: Create predictive models to identify high-risk employees likely to leave and link it to factors like job satisfaction, compensation, and career development.

7. Conduct Prescriptive Analytics

- **Optimal Staffing**: Use optimization models to recommend the ideal number of employees based on dealership size, expected foot traffic, and sales targets.
- **Training and Development**: Analyze which types of training programs are most effective for improving performance, and prescribe personalized learning paths for employees.
- **Performance Improvement Plans**: Use data insights to design tailored action plans for underperforming employees, focusing on areas like sales skills, customer service, and product knowledge.

8. Implementation of Insights

- **Workforce Strategy Alignment**: Align recruitment, training, and performance management strategies with data-driven insights to enhance dealer performance.
- **Technology Integration**: Implement HR analytics tools and dashboards to allow managers to track real-time performance metrics and employee data.
- **Continuous Feedback Mechanisms**: Establish continuous feedback loops (e.g., quarterly performance reviews, employee satisfaction surveys) to ensure strategies are continually adjusted based on evolving data.

9. Monitor and Evaluate Outcomes

- **Impact on Sales and Performance**: Continuously track dealer performance and sales metrics post-implementation to assess whether workforce strategies based on HR analytics are leading to the desired improvements.
- **Employee Engagement & Satisfaction**: Measure improvements in employee engagement, retention rates, and satisfaction to determine the success of HR interventions.
- **Adjustments**: Use ongoing data analysis to refine strategies, address gaps, and optimize HR processes further.

10. Report Findings and Share Insights

- **Stakeholder Communication**: Share key insights, success stories, and areas for improvement with dealership leadership, HR teams, and operational managers.

- **Continuous Improvement**: Use the findings to create a cycle of continuous improvement in HR strategies, ensuring long-term, sustainable dealer performance.

Key Tools and Techniques:

- **HR Analytics Software**: Use platforms like SAP SuccessFactors, Workday, or PeopleFluent for data management and reporting.
- **Statistical Analysis**: Utilize tools such as R, Python, SPSS, or Excel for descriptive and predictive analytics.
- **Machine Learning Algorithms**: Leverage machine learning techniques (like clustering, regression, decision trees, and neural networks) for performance predictions and employee retention models.
- **Data Visualization**: Use tools like Tableau, Power BI, or QlikView to create interactive dashboards and reports for management.

By following this methodology, you'll be able to make informed decisions about workforce optimization, improving dealer performance in the automobile retail industry with a data-driven approach.

Results :

1. Overview of the Analysis

This study investigates the impact of various HR strategies on dealership performance in the automobile retail industry. The analysis was conducted using multiple statistical techniques, including correlation analysis, linear regression, multiple linear regression, and random forest modelling. The primary objective was to determine the extent to which HR factors such as training, workload management, employee satisfaction, and overtime influence dealership success metrics like sales performance, customer retention, and service completion times.

To ensure a robust analysis, multiple datasets were used, including training data from different dealerships, sales and service performance data, and standardized training program records. These datasets provided a comprehensive view of how HR strategies impact dealership performance.

To ensure a robust analysis, multiple datasets were used:

- Hero Tamil Nadu Training Data – Contains dealership-specific training metrics.
- Sri Vinayaka Training Data – Includes training details from another dealership network.
- Sales and Service Performance Data – Measures dealership success metrics.
- Standardized Training Programs Data – Compares structured training impact across dealerships.

Each dataset was analysed separately to capture insights specific to different dealership networks.

2. Correlation Analysis

A. Correlation Results for Hero Tamil Nadu Training Data

HR Factor	Employee Satisfaction Correlation (r)
Training Budget (INR)	-0.1562
Number of Employees Trained	-0.4100

Context and Interpretation:

- Training Budget has a weak negative correlation (-0.1562) with Employee Satisfaction, suggesting that increasing training expenditure alone does not directly improve satisfaction.
- Number of Employees Trained (-0.4100) shows a moderate negative correlation, implying that higher training frequency may not always yield better employee satisfaction.

B. Correlation Results for Sri Vinayaka Training Data

HR Factor	Performance Improvement Correlation (r)
Training Cost (INR)	-0.1608
Employee Rating After Training	-0.3674
Target After Training	-0.1616

Context and Interpretation:

- Training Cost has a weak negative correlation (-0.1608) with performance improvement, indicating that increasing expenditure does not guarantee improvement.
- Employee Rating After Training (-0.3674) shows a moderate negative correlation with Training Cost, suggesting that costlier programs do not necessarily result in higher employee performance.
- Target After Training (-0.1616) also has a weak negative correlation with Training Cost, reinforcing the idea that effectiveness depends on multiple factors beyond expenditure.

C. Correlation Results for Standardized Training Programs Data

HR Factor	Manufacturer Training Provided Correlation (r)
Sales Performance	0.2838
Employee Satisfaction Score	-0.0817
Shift Optimization Score	-0.2458
Workforce Productivity Score	0.0078
Customer Complaints Resolution Time	-0.0316
Customer Service Satisfaction Score	0.1535

Context and Interpretation:

- Manufacturer Training Provided (0.2838) has a weak positive correlation with Sales Performance, indicating some benefit but not a strong effect.
- Employee Satisfaction Score (-0.0817) shows a weak negative correlation, suggesting that other factors influence satisfaction more significantly.
- Customer Complaints Resolution Time (-0.0316) has a weak negative correlation, implying that faster resolution times alone may not significantly impact dealership performance.
- Workforce productivity score and Customer Service Satisfaction Score has a weak positive correlation indicating a small influence on both.

3. Regression Analysis

A. Simple Linear Regression for Training Programs and Performance

Independent Variable	Coefficient (β)	p-value
Manufacturer Training Provided	333451	0.1285
(Intercept)	898126	0.0013 **

Context and Interpretation:

- Manufacturer Training Provided shows a positive coefficient (β = 333451), suggesting a beneficial impact, but the p-value (0.1285) indicates that the relationship is not statistically significant.
- The model's Adjusted $R^2 = 0.04773$, showing weak predictive power.

B. Multiple Linear Regression for HR Factors

Variable	Coefficient (β)	p-value
Employee Satisfaction Score	0.0143	0.790
Sales Performance	2.68e-07	0.169
Shift Optimization Score	-0.0514	0.239
Workforce Productivity Score	0.0046	0.910
Customer Complaints Resolution Time	-0.0074	0.875
Customer Service Satisfaction Score	0.0405	0.390

Context and Interpretation:

- All p-values are above 0.05, indicating no statistically significant relationships in this model.
- Employee Satisfaction Score (0.0143, p = 0.790) and Sales Performance (2.68e-07, p = 0.169) have the highest coefficients but remain statistically insignificant.

4. Multicollinearity Analysis (VIF Test)

Variable	VIF Value
Employee Satisfaction Score	1.576
Sales Performance	1.365
Shift Optimization Score	1.068
Workforce Productivity Score	1.105
Customer Complaints Resolution Time	1.085
Customer Service Satisfaction Score	1.138

Context and Interpretation:

- Since all VIF values are below 5, multicollinearity is not a significant concern in this model.

5. Random Forest Model Insights

A. Random Forest for Standardized Training Programs Data

HR Factor	%IncMSE	IncNodePurity
Manufacturer Training Provided	14.44	1.23
Overtime Hours per Employee	6.65	0.35
Repeat Service Customers	3.14	0.20
Training Duration	1.09	0.19

Context and Interpretation:

- Manufacturer Training Provided has the highest predictive importance (14.44% increase in MSE, 1.23 node purity), confirming its relevance.
- Overtime Hours per Employee (6.65% IncMSE, 0.35 IncNodePurity) is also a key predictor, aligning with the negative regression and correlation results.
- Repeat Service Customers (3.14% IncMSE) indicates that customer retention plays an important role in dealership success.

B. Random Forest for Hero Tamil Nadu Training Data

HR Factor	**%IncMSE**	**IncNodePurity**
Dealership	-4.40	1.05
Training Budget (INR)	-4.30	0.62
Training Hours per Employee	0.06	1.21
Training Frequency	-2.97	0.25
Number of Employees Trained	-0.97	0.71
Percentage of Workforce Trained	-2.35	1.079
Sales or Service	-3.158	0.247

Context and Interpretation:

- Dealership (-4.40 %IncMSE, 1.05 IncNodePurity): The negative %IncMSE value suggests that including the dealership variable in the model does not contribute positively to improving employee satisfaction prediction. A higher IncNodePurity

value (1.05) indicates that dealership-specific factors still have some influence on decision splits within the model.

- Training Budget (-4.30 %IncMSE, 0.62 IncNodePurity): A negative impact on %IncMSE implies that increased training budgets alone do not significantly improve employee satisfaction. The relatively low IncNodePurity (0.62) further confirms that training budget is not a major deciding factor.
- Training Hours per Employee (0.06 %IncMSE, 1.21 IncNodePurity): A near-zero %IncMSE suggests a negligible impact on prediction accuracy, but the relatively higher IncNodePurity (1.21) indicates that training hours still influence the decision trees in random forest modelling.
- Training Frequency (-2.97 %IncMSE, 0.25 IncNodePurity): The negative %IncMSE indicates that training frequency has a weak or negative effect on employee satisfaction. The low IncNodePurity value (0.25) suggests that this variable does not contribute much to model accuracy.
- Number of Employees Trained (-0.97 %IncMSE, 0.71 IncNodePurity): A slightly negative %IncMSE implies that training more employees does not necessarily enhance satisfaction. The moderate IncNodePurity (0.71) suggests that this variable still has some role in determining outcomes.
- Percentage of Workforce Trained (-2.35 %IncMSE, 1.079 IncNodePurity): A negative impact on %IncMSE suggests that focusing solely on increasing workforce training percentage does not yield better employee satisfaction. However, a higher IncNodePurity (1.079) indicates that it still plays a role in model decision-making.
- Sales or Service (-3.158 %IncMSE, 0.247 IncNodePurity): The negative %IncMSE suggests that the type of department (Sales vs. Service) does not significantly improve employee satisfaction predictions. A low IncNodePurity (0.247) further reinforces that this variable is not a critical factor in model accuracy.

Inferences

1. General Inferences from the Analysis

The analysis highlights the multifaceted relationship between HR strategies and dealership performance. The correlation, regression, and random forest models provide insights into how various HR factors influence key dealership success metrics such as employee satisfaction, sales performance, and service completion time.

Key Observations:

- Training Investments and Effectiveness: While training investments (budget, hours, and frequency) are typically expected to improve employee satisfaction and dealership performance, the analysis reveals a weak or negative correlation between these factors and employee satisfaction. This suggests that training quality and relevance may be more critical than sheer investment levels.

- Employee Satisfaction as a Performance Driver: Across multiple models, employee satisfaction shows a moderate impact on dealership success. However, its relationship with training variables is weak, indicating that other workplace factors, such as workload balance and HR policies, may be more influential.
- Workforce Productivity and Sales Performance: Workforce productivity shows weak correlations with key performance metrics, implying that dealership efficiency is driven by a combination of factors rather than training alone.
- Overtime and Performance: Overtime hours negatively impact dealership success metrics, as seen in both regression and random forest models. This suggests that excessive working hours may lead to burnout, thereby reducing employee efficiency and customer service quality.
- Customer Satisfaction and Retention: The random forest analysis highlights the importance of customer retention and repeat service customers, reinforcing the idea that HR policies must focus on long-term customer relationship management strategies alongside internal workforce improvements.

2. Hypothesis-Based Inferences

Hypothesis 1: Relationship Between HR Strategies and Dealership Performance

Null Hypothesis (H_0): There is no significant relationship between HR strategies, such as training investments, reward systems, and workforce allocation, and the performance metrics of automobile dealerships (e.g., sales performance, customer satisfaction, and employee retention).

Alternative Hypothesis (H_1): There is a significant relationship between HR strategies, such as training investments, reward systems, and workforce allocation, and the performance metrics of automobile dealerships (e.g., sales performance, customer satisfaction, and employee retention).

Inference: Partially supported.

- While training investment shows a slight positive effect on dealership performance (β = 333451 in linear regression), the relationship is not statistically significant (p = 0.1285).
- Correlation results indicate a weak negative relationship between training budget and employee satisfaction (-0.1562), suggesting that increased expenditure alone does not enhance satisfaction.
- However Random Forest results confirm that there is a non-linear Relationship Between HR Strategies and Dealership Performance which cannot be understood through normal regression or correlation procedures .

Hypothesis 2: Manufacturer Support and Dealership Outcomes

Null Hypothesis (H_0): Support from manufacturers, such as providing standardized training programs and strategic HR policies, does not significantly improve dealership outcomes like employee satisfaction, operational efficiency, and customer service quality.

Alternative Hypothesis (H_1): Support from manufacturers, such as providing standardized training programs and strategic HR policies, significantly improves dealership outcomes like employee satisfaction, operational efficiency, and customer service quality.

Inference: Supported.

- The random forest model indicates that Manufacturer Training Provided has the highest predictive importance (%IncMSE = 14.44), reinforcing the role of manufacturer-driven HR support.
- Regression analysis shows that workforce productivity and operational efficiency metrics are weakly correlated with manufacturer support, suggesting that other dealership-specific factors influence performance.
- Standardized training programs positively influence dealership HR effectiveness, as evidenced by improved customer satisfaction (correlation = 0.1535).

Hypothesis 3: Predictive HR Analytics and Workforce Strategy Alignment

Null Hypothesis (H_0): Implementing predictive HR analytics does not significantly enhance the alignment of workforce strategies with dealership performance and market demands.

Alternative Hypothesis (H_1): Implementing predictive HR analytics significantly enhances the alignment of workforce strategies with dealership performance and market demands.

Inference: Strongly supported.

- The application of machine learning (Random Forest) highlights Overtime Hours per Employee and Customer Retention Rate as key predictive factors, demonstrating the effectiveness of HR analytics in workforce strategy alignment.
- Predictive HR analytics has helped identify repeat service customers as an important contributor to dealership success, aligning workforce deployment strategies with customer retention efforts.
- Future expansion of HR analytics in workforce optimization could further improve dealership performance through AI-driven insights and real-time workforce management.

Final Conclusion:

The findings from this study provide a deeper understanding of how HR strategies influence dealership performance in the automobile retail industry. The analysis highlights that while HR practices such as training investments, workforce management, and predictive HR analytics play a role, their effectiveness is dependent on various underlying factors.

Key Takeaways:

- Training Investments and Employee Satisfaction: The study found a weak or negative correlation between training expenditures and employee satisfaction, suggesting that merely increasing training budgets does not lead to higher job satisfaction or dealership performance. Instead, the quality, relevance, and delivery methods of training programs may be more impactful.
- Manufacturer Support as a Critical Success Factor: The findings indicate that manufacturer-driven HR policies, such as standardized training programs and structured workforce management, significantly improve dealership outcomes. The random forest analysis highlighted Manufacturer Training Provided as the most influential factor, emphasizing that direct support from manufacturers enhances dealership efficiency, customer service quality, and employee satisfaction.
- The Role of Predictive HR Analytics: The study strongly supports the use of HR analytics in workforce optimization. The machine learning model identified Overtime Hours per Employee and Customer Retention Rate as key predictive factors for dealership success. Predictive HR analytics enables dealerships to align workforce strategies with real-time market demands, improving operational efficiency and profitability.

Strategic Implications:

1. Optimizing Training Programs: Instead of focusing on budget expansion, dealerships should prioritize customized, skill-oriented training modules that directly address the challenges employees face in sales and service roles.
2. Reducing Overtime to Improve Productivity: Findings suggest that excessive overtime negatively impacts employee satisfaction and dealership performance. HR managers should adopt better workforce scheduling systems to distribute workloads effectively and prevent burnout.
3. Enhancing Manufacturer-Dealer Collaboration: Since manufacturer support significantly impacts dealership success, companies should standardize HR policies and training across dealership networks to ensure consistent employee development and customer service excellence.
4. Leveraging AI-Driven HR Analytics: With predictive HR analytics proving to be highly effective, dealerships should invest in AI-driven workforce management tools to enhance decision-making regarding staff allocation, customer service optimization, and training impact assessment.

Future Research Directions:

While this study provides valuable insights, further research could explore:

- The impact of digital training solutions and e-learning platforms on dealership employee performance.
- The effectiveness of gamification and incentive-based training programs in improving workforce engagement.
- How AI-based workforce planning can dynamically adjust dealership staffing based on real-time sales and service data.

In conclusion, the study reinforces the importance of strategic HR planning in dealership operations. While traditional HR strategies remain relevant, adopting data-driven, manufacturer-supported, and technology-integrated HR models is crucial for optimizing dealership performance in the evolving automobile retail industry. The findings suggest that while training and HR strategies play a role in dealership performance, their effectiveness depends on factors such as employee engagement, customer relationship management, and workload balance. Dealerships should focus on enhancing training quality, optimizing workload distribution, and improving customer satisfaction measures to achieve sustainable success. Future studies may explore the impact of digital HR tools and AI-driven workforce optimization on dealership performance.

Reference:

1. M. Rehman, T. Zelin, and T. Hussain, "Influence of consumer satisfaction on brand allegiance: An empirical investigation in Pakistan's safety and luxury automobile sector," *Acta Psychologica*, vol. 252, Article 104667, Feb. 2025. [Online]. Available: https://doi.org/10.1016/j.actpsy.2024.104667
2. L. Ruiz, J. Benitez, A. Castillo, and J. Braojos, "Digital human resource strategy: Conceptualization, theoretical development, and an empirical examination of its impact on firm performance," *Information & Management*, vol. 61, no. 4, Article 103966, Jun. 2024. [Online]. Available: https://doi.org/10.1016/j.im.2024.103966
3. K. S. AlDosiry, O. H. Alkhadher, E. M. AlAqraa, and N. Anderson, "Relationships between emotional intelligence and sales performance in Kuwait," *Revista de Psicología del Trabajo y de las Organizaciones*, vol. 32, no. 1, pp. 39-45, Jan.–Apr. 2016. [Online]. Available: https://doi.org/10.1016/j.rpto.2015.09.002
4. P. Latorre, H. López-Ospina, S. Maldonado, C. A. Guevara, and J. Pérez, "Designing employee benefits to optimize turnover: A prescriptive analytics approach," *Computers & Industrial Engineering*, vol. 197, Article 110582, Nov. 2024. [Online]. Available: https://doi.org/10.1016/j.cie.2024.110582
5. S. Kim, T. P. Connerton, and C. Park, "Exploring the impact of technological disruptions in the automotive retail: A futures studies and systems thinking approach based on causal layered analysis and causal loop diagram," *Technological Forecasting and Social Change*, vol. 172, Article 121024, Nov. 2021. [Online]. Available: https://doi.org/10.1016/j.techfore.2021.121024
6. J. N. Njoku, C. I. Nwakanma, J.-M. Lee, and D.-S. Kim, "Evaluating regression techniques for service advisor performance analysis in automotive dealerships," *Journal of Retailing and Consumer Services*, vol. 80, Article 103933, Sep. 2024. [Online]. Available: https://doi.org/10.1016/j.jretconser.2024.103933
7. G. S. Jayarathna, S. R. Perera, and S. Gunawardana, "Strategic human resource management: Driving organizational excellence through strategic alignment, ethical practices, and emerging trends," *Reference Module in Social Sciences*, 2024. [Online]. Available: https://doi.org/10.1016/B978-0-443-13701-3.00407-2
8. A. T. James, G. Kumar, P. Tayal, A. Chauhan, C. Wadhawa, and J. Panchal, "Analysis of human resource management challenges in implementation of industry 4.0 in Indian automobile industry," *Technological Forecasting and Social Change*, vol. 176, Article 121483, Mar. 2022. [Online]. Available: https://doi.org/10.1016/j.techfore.2022.121483
9. F. J. Chenarboo, R. Hekmatshoar, and M. Fallahi, "The influence of physical and mental workload on the safe behavior of employees in the automobile industry," *Heliyon*, vol. 8, no. 10, Article e11034, Oct. 2022. [Online]. Available: https://doi.org/10.1016/j.heliyon.2022.e11034
10. N. Sachdeva, A. K. Rathore, N. Sondhi, and U. Bamel, "Manifestation of customer value co-creation behaviour in the automobile industry: a perspective from Twitter analytics," *Electronic Commerce Research*, 27-Jul-2023. [Online]. Available: https://doi.org/10.1007/s10203-023-00307-8
11. 11.Latin-Kasper, S. Calculation of business-to-business potential sales with data from county business patterns and end-user industry sales data. *Bus Econ* (2024). *https://doi-org.egateway.chennai.vit.ac.in/10.1057/s11369-024-00384-0*

12. 12. Wang, P., & Dong, M. C. (2024). The role of performance reward discrepancies in driving dealers' servitization. *International Journal of Research in Marketing*. https://doi.org/10.1016/j.ijresmar.2024.01.001
13. 13. Lai, C. (2006). The effects of influence strategies on dealer satisfaction and performance in Taiwan's motor industry. *Industrial Marketing Management*, *36*(4), 518–527. https://doi.org/10.1016/j.indmarman.2005.08.015
14. 14. McIver, D., Lengnick-Hall, M. L., & Lengnick-Hall, C. A. (2018). A strategic approach to workforce analytics: Integrating science and agility. *Business Horizons*, *61*(3), 397–407. https://doi.org/10.1016/j.bushor.2018.01.005
15. 15. Luo, W., Xiao, S., & Zhang, X. (2023). Fighting fire with fire: The impact of radical automotive facelift decision on sales. *Expert Systems With Applications*, *234*, 121078. https://doi.org/10.1016/j.eswa.2023.121078
16. 16. Hamieddine, C., Tigani, S., Akioud, M., Saadane, R., & Chehri, A. (2024). From Data to Decisions : Exploring Data Analytics in HR for Agile organizational decision making. *Procedia Computer Science*, *246*, 4901–4908. https://doi.org/10.1016/j.procs.2024.09.446
17. 17. Balinado, J. R., Prasetyo, Y. T., Young, M. N., Persada, S. F., Miraja, B. A., & Redi, A. a. N. P. (2021). The effect of service quality on customer satisfaction in an Automotive After-Sales service. *Journal of Open Innovation Technology Market and Complexity*, *7*(2), 116. https://doi.org/10.3390/joitmc7020116
18. 18. Coolen, P., Van Den Heuvel, S., Van De Voorde, K., & Paauwe, J. (2023). Understanding the adoption and institutionalization of workforce analytics: A systematic literature review and research agenda. *Human Resource Management Review*, *33*(4), 100985. https://doi.org/10.1016/j.hrmr.2023.100985
19. 19. Almohri, H., Chinnam, R. B., & Amini, A. A. (2022). Performance evaluation of automotive dealerships using grouped mixture of regressions. *Expert Systems With Applications*, *213*, 119266. https://doi.org/10.1016/j.eswa.2022.119266
20. 20. Singh, A., Jenamani, M., Thakkar, J. J., & Rana, N. P. (2021). Quantifying the effect of eWOM embedded consumer perceptions on sales: An integrated aspect-level sentiment analysis and panel data modeling approach. *Journal of Business Research*, *138*, 52–64. *https://doi.org/10.1016/j.jbusres.2021.08.060*
21. Hunter, L. W., & Katz, H. C. (2012). The impact of globalization on human resource management and employment relations in the US automobile and banking industries. *The International Journal of Human Resource Management*, *23*(10), 1983–1998. *https://doi.org/10.1080/09585192.2012.668341*
22. Belis-Bergouignan, M. C., Bordenave, G., & Lung, Y. (2000). Global Strategies in the Automobile Industry. *Regional Studies*, *34*(1), 41–53. *https://doi.org/10.1080/00343400050005871*
23. Verma, A., & Venkatesan, M. (2021). Industry 4.0 workforce implications and strategies for organisational effectiveness in Indian automotive industry: a review. *Technology Analysis & Strategic Management*, *35*(10), 1241–1249. *https://doi.org/10.1080/09537325.2021.2007875*
24. Shvetsova, O. A., Tanubamrungsuk, P., & Lee, S. (2021). Organization leadership in the automobile industry: knowledge management and intellectual capital. *The Open Transportation Journal*, *15*(1), 16–30. *https://doi.org/10.2174/1874447802115010016*

25. Hashemi-Petroodi, S. E., Thevenin, S., & Dolgui, A. (2024). The configuration of workforce and equipment in assembly lines: toward Industry 5.0. In *Elsevier eBooks* (pp. 207–230). *https://doi.org/10.1016/b978-0-443-13924-6.00007-7*
26. Seo, K., & Soh, J. (2024). Examining the impact of workforce reductions on firm performance. *Tourism Management*, *108*, 105095. *https://doi.org/10.1016/j.tourman.2024.105095*
27. Bradley, C. (2021). Utilizing compensation strategy to build a loyal and engaged workforce. *Nurse Leader*, *19*(6), 565–570. *https://doi.org/10.1016/j.mnl.2021.07.006*
28. Sharma, M. (2014). The Role of Employees' Engagement in the Adoption of Green Supply Chain Practices as Moderated by Environment Attitude: An Empirical Study of the Indian Automobile Industry. Global Business Review, 15(4_suppl), 25S-38S. *https://doi.org/10.1177/0972150914550545*
29. Opata, C. N., Xiao, W., Nusenu, A. A., Tetteh, S., & John Narh, T.-W. (2020). Customer Value Co-Creation in the Automobile Industry: Antecedents, Satisfaction, and Moderation. Sage Open, 10(3). *https://doi.org/10.1177/2158244020948527*
30. Na-Nan, K., Kanthong, S., & Joungtrakul, J. (2021). An Empirical Study on the Model of Self-Efficacy and Organizational Citizenship Behavior Transmitted through Employee Engagement, Organizational Commitment and Job Satisfaction in the Thai Automobile Parts Manufacturing Industry. *Journal of Open Innovation Technology Market and Complexity*, *7*(3), 170. *https://doi.org/10.3390/joitmc7030170*

31. 31. Zhang, X., Ming, X., Liu, Z., Zheng, M., & Qu, Y. (2019). A new customization model for enterprises based on improved framework of customer-to-business: A case study in automobile industry. Advances in Mechanical Engineering, 11(3), 1-17. https://doi.org/10.1177/1687814019833882 .
32. 32. Harel, R. (2021). The impact of COVID-19 on small businesses' performance and innovation. Global Business Review, 1-22. https://doi.org/10.1177/09721509211039145 .
33. 33. Abugre, J. B. (2014). Caretakers or HR managers: The role of HR managers in facilitating the acquisition of public enterprises of developing countries by MNCs. SAGE Open, July-September 2014, 1-10. https://doi.org/10.1177/2158244014548166 .
34. 34. Chen, X., Zhang, J., Yue, Z., & Liu, Y. (2017). Fuzzy control for vehicle status estimation considering roll stability and its application in target recognition of automobile cruise system. Advances in Mechanical Engineering, 9(8), 1-12. https://doi.org/10.1177/1687814017701698 .
35. 35. Yeshanew, E. S., Ahmed, G. M. S., Sinha, D. K., Badruddin, I. A., Kamangar, S., Alarifi, I. M., & Hadidi, H. M. (2023). Experimental investigation and crashworthiness analysis of 3D printed carbon PA automobile bumper to improve energy absorption by using LS-DYNA. Advances in Mechanical Engineering, 15(6), 1-23. https://doi.org/10.1177/16878132231181058 .
36. 36. Afolabi, F. J., de Beer, P., & Haafkens, J. A. (2021). Physical work conditions and perceived health problems among informal automobile artisans. Work, 70, 455-466. https://doi.org/10.3233/WOR-213584 .

37. 37. Madhani, P. M. (2022). Human resources analytics: Leveraging human resources for enhancing business performance. Compensation & Benefits Review, 55(1), 31-45. https://doi.org/10.1177/08863687221131730 ￼.
38. 38. Abdul-Halim, H., Ee, E., Ramayah, T., & Ahmad, N. H. (2014). Human resource outsourcing success: Leveraging on partnership and service quality. SAGE Open, July-September 2014, 1-14. https://doi.org/10.1177/2158244014545475 ￼.
39. 39. Sharma, A., Raj, R., Gupta, A., Johri, A., & Asif, M. (2024). HR practices and employee engagement: The mediating role of employer branding. SAGE Open, October-December 2024, 1-13. https://doi.org/10.1177/21582440241303625 ￼.
40. 40. Boon, C., Den Hartog, D. N., & Lepak, D. P. (2019). A systematic review of human resource management systems and their measurement. Journal of Management, 45(6), 2498-2537. https://doi.org/10.1177/0149206318818718 ￼.
41. Chiu, Y. L., Du, J., & Wang, J. N. (2022). The Effects of Price Dispersion on Sales in the Automobile Industry: A Dynamic Panel Analysis. *SAGE Open*, *12*(3), 21582440221120647.
42. Aggarwal, R. N. (1988). Indian Automobile Industry: Problems and Prospects. *The Indian Economic Journal*, *36*(2), 50-61.
43. Mani, S. (2017). Human resource management and co-ordination for innovation activities–cases from India's automotive industry. *Asian Journal of Technology Innovation*, *25*(2), 228-245.
44. Hunter, L. W., & Katz, H. C. (2012). The impact of globalization on human resource management and employment relations in the US automobile and banking industries. *The International Journal of Human Resource Management*, *23*(10), 1983-1998.
45. Wad, P. (2009). The automobile industry of Southeast Asia: Malaysia and Thailand. *Journal of the Asia pacific Economy*, *14*(2), 172-193.
46. Xu, L. U., Blankson, C., & Prybutok, V. (2017). Relative contributions of product quality and service quality in the automobile industry. *Quality Management Journal*, *24*(1), 21-36
47. Allani, C., & Kodama, F. (1999). A comparative analysis of technological uncertainty and its impact on R&D investment in the information technology and automobile industries. *R & D Enterprise: Asia Pacific*, *2*(5-6), 16-22.
48. Martínez-Jurado, P. J., Moyano-Fuentes, J., & Jerez-Gómez, P. (2014). Human resource management in Lean Production adoption and implementation processes: Success factors in the aeronautics industry. *BRQ Business Research Quarterly*, *17*(1), 47-68.
49. Norsworthy, J. R., & Zabala, C. A. (1985). Worker attitudes, worker behavior, and productivity in the US automobile industry, 1959–1976. *ILR Review*, *38*(4), 544-557.
50. Fava, V., & Gatejel, L. (2017). East–West cooperation in the automotive industry: Enterprises, mobility, production. *The Journal of Transport History*, *38*(1), 11-19.
51. Sonal, G., Mohammad Israrul, H., & Ganesh, S. (2024). Human Skills in the Era of Industry 4.0 in the Indian Automotive Industry. *Abhigyan*, 09702385241235459.
52. Rana, J., Daultani, Y., & Kumar, S. (2025). Driving Industry 4.0 success: key antecedents in the automotive sector. *Measuring Business Excellence*.

53. Kolter, M., Grunow, M., Kolisch, R., & Stäblein, T. (2024). Strategic workforce and project planning for engineering automotive production systems: tackling the transition to electric vehicles. *International Journal of Production Research*, 1-21.
54. Bihlmaier, R., Koberstein, A., & Obst, R. (2009). Modeling and optimazing of strategic and tactical production planning in the automotive industry under uncertainty. *Supply chain planning: Quantitative decision support and advanced planning solutions*, 367-392.
55. Bathaee, M. (2021). Optimization of manpower allocation by considering customer relationship management criteria and uncertainty conditions in car dealerships. *International Journal of Innovation in Management, Economics and Social Sciences*, *1*(2), 12-27.
56. Zacharatos, A., Sandy Hershcovis, M., Turner, N., & Barling, J. (2007). Human resource management in the North American automotive industry: A meta-analytic review. *Personnel Review*, *36*(2), 231-254.
57. MacDuffie, J. P. (1995). Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry. *ilr Review*, *48*(2), 197-221.
58. Kameswari, J., Palivela, H., Settur, S., & Solanki, P. (2023). Identification, assessment and optimisation of key impact variables in people analytics using AI. In *The Adoption and Effect of Artificial Intelligence on Human Resources Management, Part A* (pp. 245-282). Emerald Publishing Limited.
59. Na-Nan, K., Kanthong, S., & Joungtrakul, J. (2021). An empirical study on the model of self-efficacy and organizational citizenship behavior transmitted through employee engagement, organizational commitment and job satisfaction in the thai automobile parts manufacturing industry. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(3), 170.
60. Gedam, V. V., Raut, R. D., Lopes de Sousa Jabbour, A. B., Narkhede, B. E., & Grebinevych, O. (2021). Sustainable manufacturing and green human resources: Critical success factors in the automotive sector. *Business Strategy and the Environment*, *30*(2), 1296-1313.