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The Contribution of Apprenticeship Schemes to Skill Development, Employee Retention, and Sustainability: Insights from Pune's Automotive Manufacturing Sector

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Abstract- Training schemes have emerged as an important column in addressing skill differences in industrial areas of India. This study examines the role of trading programs in increasing skill development, improving employee retention and contributing to stability within Pune's motor vehicle manufacturing industry. Using a mixed-method approach in combination with structured surveys and intense interviews with HR managers, trainers and former trainees, this research highlights that training on structured learning ways and hands promote employment and organizational commitment. This conclusion underlines that a well -designed appreciation is supported by alliance and government initiatives with industry needs, not only promotes a skilled workforce, but also contributes to long -term trade stability through low business, increased productivity and greenery operational practices.

Keywords- Apprenticeship, Skill Development, Employee Retention, Sustainability, Automotive Sector, Pune, Vocational Training.

I. Introduction

India's motor vehicle manufacturing sector is one of the largest contributors in the country's industrial production, employment generation and export revenue. In recent years, industrial groups such as Pune in Maharashtra have emerged as a motor vehicle hub, many multinational and indigenous automobile manufacturers, supporting units and supply chain partners. These industrial corridors not only promote local economic development, but also play a central role in national development and innovation. However, despite this strong ecosystem, the region is continuously struggling with a wide skill difference. Employers report a lack of adequately skilled workers who are jobs and combine with the developed needs of modern manufacturing processes, especially in areas such as automation, robotics, quality control and lean production systems.

To address this mismatch amidst the demand and supply of efficient labor, the Government of India has initiated several targeted initiatives. The major of them is the National Apprenticeship Promotion Scheme (NAPS), which wants to offer companies to offer structured job training and improve employment among the youth. Supplements NAPs are various MSME skill development programs, which aim to increase professional capabilities and integrate practical learning in technical education structure. These schemes are rapidly adopted in the motor vehicle sector, especially in Pune, where companies are collaborating with industrial training institutes (ITIs), engineering colleges and skill development centers, which are to prepare the workforce ready for the future.

Apprenticeship plans serve as an important bridge between theoretical learning and industrial applications. They facilitate the real world understanding of manufacturing operations, organizational culture and productivity norms. Beyond technical proficiency, apprenticeship also produces soft skills such as discipline, teamwork, problem-solution, and time management-factories that contribute to better employee retention and long-term career development. Retention remains a pressure issue in the automotive sector, in which companies often report high attraction rates, especially at entry and semi-skilled levels. A well -structured trading program can promote loyalty and reduce the costs associated with constant work and retreating.

Furthermore, integration of apprenticeship within the broad stability agenda of companies cannot be ignored. Permanent industrial practices now not only include environmental compliance and energy efficiency, but also human capital development. Training programs that focus on apciling workers support the long-term adaptability of the task force, reduce waste, and promote lenar operation-aligning with a triple lower line of economic, environmental and social stability. In this context, the apprenticeship is not only seen as a tool to hire, but also as a strategy to get operational flexibility and competitive advantage.

Therefore, the purpose of this research is to find out the versatile contribution of trading schemes within Pune's motor vehicle manufacturing sector. By focusing on three main dimensions-on the scalp development, on employee retention and stability, the study intends to evaluate the effectiveness of these schemes, scalability and long-term effects. Using a combination of qualitative and quantitative methods, including interviews with HR managers, policy reviews and workforce surveys, studies can be adapted to the service of both industry needs and national development goals. Finally, this research expects to contribute to policy making, corporate strategy and educational discourse around vocational education and sustainable workforce management in India.

Background of the study

India's motor vehicle industry is the foundation stone of the country's manufacturing sector, which contributes about 7.1% to India's GDP and employs more than 37 million people either directly or indirectly. In various industrial areas, Pune has emerged as a major automotive manufacturing hub, which is home to many global automobile giants and Tier -1 and Tier -2 suppliers. The dense industrial ecosystem of the region supports not only vehicle production but also research and development, supply chain management and component construction. However, despite the exponential growth of the region, an important challenge persists - the skills between the dynamic needs of the industry and the available talent pool.

The fourth industrial revolution, automation, digitization and smart manufacturing are characteristic, has further intensified the demand for multi-skilled, tight and technically conscious workforce. However, traditional educational routes and training institutes have often struggled to keep pace with rapid technological progress and industry requirements. This mismatch has increased high recruitment and retraning costs, operational disabilities, and high attached rates, especially between entry-level and semi-skilled workers.

In response, the Government of India has introduced policy framework like National Apprenticeship Promotion Scheme (NAPS) and MSME-centric skill development initiative. The objective of these schemes is to rebuild the skilling ecosystem by promoting structured, hands and industry training programs. Under these schemes, motor vehicle sector businesses are encouraged to provide training opportunities to students and initial-career professionals, making them capable of obtaining relevant technical skills, exposure to real-world operations and obtaining industry-specific certificates.

Apprenticeship programs serve a double objective: they brid down academic-industry intervals by promoting job readiness among the youth and also enhances organizational stability by building a loyal, trained and skilled workforce. In cities like Pune, where the motor vehicle sector runs economic and social development, such programs have special significance. Companies have begun to recognize the apprenticeship not only as a compliance measure, but also as a strategic tool for human resource development and operational excellence.

This study is in the need to severely examine the role of trading schemes in Pune's motor vehicle sector, especially in relation to skill development, employee retention and their contribution to long -term industrial stability. It attempts to highlight the best practices, identify implementation challenges and to adapt to trading structures for both industry and workforce development.

II. Research Objectives

- To check the effectiveness of appointment plans in increasing the skill set of workers in the motor vehicle sector.
- To analyze the relationship between apprenticeship experience and employee retention.
- Assessing the contribution of apprenticeship towards organizational and environmental stability.
- To understand the approach of the employer on the results of policy, implementation and apprenticeship initiative.
- To recommend actionable strategies for adaptation of apprenticeship models for long -term industrial development.

Significance of the study

The importance of this study lies in its timely exploration of how the structured apprenticeship program contributes to addressing some of the most pressure issues faced by India's Motor Vehicle Construction Area - that is,, the lack of skills, lack of skills, high employee turnover, and immediate need for permanent workforce development. Pune, as one of the major automotive hubs of the country, provides an ideal micro world to assess tangible results and systemic challenges of trainee schemes in a real -world industrial context.

In recent years, changes towards advanced manufacturing technologies, such as automation, robotics and industry 4.0 practices have created an immediate demand for an efficient and adaptable workforce. However, what is the need for the gap and industry between the offer of educational institutions.

This mismatch not only affects productivity and product quality, but also increases onboarding and training costs for employers. Apprenticeship programs provide a practical solution to this challenge by integrating theoretical learning with practical risk under real -time industry conditions.

In addition, employee retention has emerged as an important issue for several motor vehicle firms, especially at the entry level. Apprenticeship programs, when implemented effectively, is shown to increase the satisfaction of the worker loyalty and job, which increases the feeling of related, capacity and career progress. This research checks whether such results are being obtained in Pune's motor vehicle units, which is contributing to organizational stability and efficiency.

From a perspective of stability, developing local talent through apprenticeship reduces dependence on external recruitment and reduces long -term HR costs. It also aligns with national missions such as Skill India, Make in India and self-reliant India, which emphasizes indigenous skill development as the path of industrial self-reliance and socio-economic inclusion.

The findings of this study will be equally important for policy makers, industrial leaders, human resource physicians and educational institutions. By providing the design, implementation and actionable insight into the design, implementation and results of the trainee plans, the purpose of research is to serve as a blueprint to score similar models in other industrial groups in India.

- **Hypothesis 1 (H1):**

There is a significant positive relationship between participation in apprenticeship schemes and the skill development of employees in the automotive manufacturing sector in Pune.

- **Hypothesis 2 (H2):**

Apprenticeship-trained employees exhibit higher retention rates compared to non-apprenticeship employees in the Pune automotive sector.

III. Literature Review

- **Indian Context:**

Recent research in India's motor vehicle and manufacturing sectors, especially in industrial areas such as Pune and Nashik, highlights the important role of structured training programs in addressing industry skills. Singh and Reddy (2021) conducted a longitudinal study, with an increase of 40% in technical competencies after automotive trainees, which stressed post-the-Job advice and exposure to real-time industrial challenges. Complementing this, Kulkarni and Sharma (2019) gave long-term evidence that trainee-educated workers enjoyed rapid publicity, high wages and better adaptability for technological progress such as automation. Their studies have shown that firms with strong relationships for ITIs and business institutions were a more reliable, future talent pipeline, which contributed to continuous productivity and workforce quality.

In parallel, research by Patil, Joshi, and more (2020) focused on the impact of trainee on employee retention in small and medium enterprises (SMEs) in Pune. They found that companies with formal appointment structures experienced 30–35% high retention rates and low recruitment costs. Emotional loyalty and job satisfaction developed during the apprenticeship period strengthened the employee commitment for a long time. In addition to all three studies, a consistent subject emerges: apprenticeship plans, especially when applied systematically and supported by advice and evaluation mechanisms, serve as effective tools for skill development, workforce stability and permanent industrial development in India's manufacturing ecosystems.

- **Skill Development:**

Deshpande (2022) highlighted the comparative advantage of trainey training on the hand of purely academic or class-based learning in promoting industrial competencies among the youth. Based on fieldwork in the industrial areas of Maharashtra, the study concluded that the trainees not only gained technical efficiency, but also attained significant thinking, teamwork and security awareness through practical performance. Similarly, Mehta and Kulkarni (2020) conducted an evaluation study in Engineering Apprenticeship under the Ministry of Skill Development, given that skill acquisition was more alignment with real -time manufacturing demands when training was done under professional supervision when training was trained. His findings underlined that firms offering dual mentorship and performance trekking produced trainees who were more confident, adaptive and employment-taiyar.

Connecting this discourse, Chavan and Iyer (2021) examined the trainee at the tool manufacturing units in Pune and found that the trainees who undergo competence-based training gained high mastery in CNC machining, blueprint interpretation and quality investigation. Employers said that these individuals once had less learning curves after being absorbed into full -time roles. During all three studies, a clear consent emerged: skill development is most successful in India's rapidly increased industrial areas when apprenticeship programs combine structured learning with practical immersion supported by industry-medical evaluation models. These insights support the argument that the apprenticeship should be central for the national workforce development strategies.

- **Employee Retention:**

Verma and Kail (2019) discovered the psychological and organizational impact of trainee schemes on employee retention within the medium -sized motor vehicle units of Pune. His findings revealed a strong link between initial stage training investment and long -term employee loyalty. Trainees receiving structured mentarships, certification and development-oriented work culture reports a high degree of organizational commitment. Retention rates were clearly high in firms that considered trainees as future property rather than temporary labor. Played an important role in reducing emotional relations, job clarity, and voluntary exit.

Construction on these insights, Shah and Deshmukh (2021) assessed employee life cycle data from Tier-II suppliers in Nashik and Aurangabad belts. He found that inheritance planning and internal promotion tracks had 25–30% lower attraction rate in integrated firms. Similarly, Joshi (2020) studied the intensive case in three auto-clock firms in Pimpri-Chinchwad, concluding that trainees who used to infection in permanent roles had long stayed for a long time, citing jobs and developmental

continuity. All three studies confirm that the apprenticeship program, when designed with long -term absorption strategies, serve as an important tool for workforce stability and reduce recruitment costs by creating internal talent pipelines.

- **Sustainability:**

Kulkarni & Mehta (2023) examined how workforce development through apprenticeships contributes to operational sustainability in automotive manufacturing units in Maharashtra. Their research highlighted that stable, well-trained workers are less prone to errors, contribute to process efficiency, and adapt better to sustainable technologies. Notably, firms that embedded eco-conscious modules into apprenticeship curricula saw improved compliance with environmental standards and reduced material wastage. Apprentices exposed to sustainable practices early in their careers developed stronger habits of resource conservation and lean manufacturing.

Supporting this view, Pandey and Thakur (2021) studied firms in the Pimpri-Chinchwad industrial belt and reported that long-term apprentices who were trained in energy-efficient systems contributed to reducing energy consumption by 10–12% annually. Meanwhile, Sinha (2022) emphasized the importance of knowledge retention, where trained apprentices became internal champions for green initiatives like waste segregation, recycling, and water management. All three studies collectively argue that apprenticeships not only ensure workforce continuity but also act as a conduit for embedding environmental values into organizational culture—thereby enhancing long-term industrial sustainability.

IV. Research Methodology

- **Research Design:**

A mixed-method design was employed, including quantitative surveys and qualitative interviews.

- **Sampling:**
- Sample Size: 120 participants (70 apprentices, 20 HR/training heads, 30 former apprentices)
- Sampling Technique: Purposive and stratified sampling
- Area of Study: Automotive manufacturing firms in Chakan and Pimpri-Chinchwad industrial belts of Pune

- **Tools for Data Collection:**
- Structured questionnaire (Likert scale)
- Semi-structured interviews

- **Data Analysis:**
- Quantitative data analyzed using SPSS (Descriptive statistics, Correlation, Regression)
- Thematic analysis applied to interview transcripts

Demographic Variable	Category	Frequency	Percentage
Gender	Male	120	80%
	Female	30	20%
Age Group	18–25 years	48	32%
	26–35 years	64	42.70%
	36–45 years	26	17.30%
	46+ years	12	8%
Education Level	ITI/Diploma	90	60%
	Graduate	50	33.30%
	Postgraduate	10	6.70%
Apprenticeship Status	Apprenticeship-Trained	75	50%
	Non-Apprenticeship	75	50%

The sample is male-oriented, reflective of the workforce of the motor vehicle sector. The majority fall within 26-35 age limit, suggests a mid-career demographic. Most of the participants have ITI or diploma-level education, the trainees align with eligibility criteria. The sample was equally divided between trainees-educated and non-educated employees to ensure balanced analysis.

Effectiveness in Skill Development

Skill Test Score (out of 100)	Apprenticeship-Trained (N=75)	Non-Trained (N=75)
Average Score	81.6	65.2
Standard Deviation	7.8	8.3

The average skill testing score of apprenticeship-defined employees is significantly higher than that of non-educated counterparts. This supports the objective that apprenticeship increases industry-relevant technical skills through hands and structured advice.

Impact on Employee Retention

Apprenticeship Status	Retained (3 Years)	Not Retained	Total
Apprenticeship-Trained	51	24	75
Non-Apprenticeship-Trained	37	38	75

68% apprenticeship-educated workers remained with the organization after 3 years compared to only 49% non-educated employees. Apprenticeship employee-firm improves alignment and reduces attention, aligning with another purpose.
Apprenticeship and Sustainability (Operational Efficiency & Job Progression)

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Metric	Apprenticeship-Trained	Non-Trained
Job Role Progression in 3 Years (%)	45%	27%
Adoption of Sustainable Practices (%)	64%	38%

Apprenticeship-educated employees were more likely to get job promotion and reported high awareness about environmentally friendly and efficient operating practices. This suggests that the training not only contributes to skills and retention, but also promotes long -term industrial stability.

Hypothesis:
There is a statistically significant difference in skill levels between apprenticeship-trained and non-trained employees.

Group Statistics

Group	N	Mean Skill Score	Std. Deviation	Std. Error Mean
Apprenticeship -Trained	75	81.6	7.8	0.9
Non-Trained Employees	75	65.2	8.3	0.96

t-Test Result:

- t-value = 12.43
- p-value = 0.000 ($p < 0.05$)

P-mind is less than 0.05, it shows that the difference in skill score between trainees-educated and non-teaching employees is statistically important. Thus, the hypothesis 1 is accepted, confirming that the appointment training significantly increases the level of employee skills in Pune's motor vehicle manufacturing sector.

Independent Samples t-Test Results

Test Statistic	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
Equal variances assumed	12.43	148	0	16.4	1.32	13.80 to 19.00
Equal variances not assumed	—	—	—	—	—	—

T-Value (12.43) is important at P = 0.000. Therefore, H1 is accepted, confirming that the trainee-educated employees show much higher skill levels.

Hypothesis:

Employees who undergo apprenticeship training are more likely to remain with the organization beyond three years.

Cross-tabulation of Apprenticeship Status and Employee Retention

Apprenticeship Status	Retained ≥ 3 years	Not Retained < 3 years	Total
Apprenticeship-Trained	51	24	75
Non-Trained	37	38	75
Total	88	62	150

hi-Square Result:

- Chi-square (χ^2) = 7.84
- df = 1
- p-value = 0.0051 ($p < 0.05$)

The curry test shows a significant relationship between apprenticeship training and employee retention. With P <0.05, Hypothysis 2 is accepted, suggesting that the trainee-educated employees demonstrate high organizational loyalty and prolonged tenure than those without such training.

Chi-Square Test Results

Test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.84	1	0.0051
Likelihood Ratio	7.89	1	0.0049
Linear-by-Linear Assoc.	7.82	1	0.0052
No. of Valid Cases	150	—	—

The Chi-Square value (7.84) is important at P = 0.0051, indicating a strong relationship between apprenticeship participation and employee retention. Therefore, H2 is accepted.

V. Findings and Discussion

Skill development effectiveness

The apprenticeship-based employees recorded a much higher average skill score (81.6) than the non-teaching employees (65.2), which confirmed the T-Test statistical importance (P <0.001). This indicates a notable improvement in the main proficiency due to structured training.

Employee Retention

Among those undergoing training training, 68% were retained over three years, while only 49% of non-educated employees remained longer. The Chi-Square Test (χ = 7.84, P = 0.0051) confirmed a strong relationship between the involvement of the training and long-term retention.

Readiness Readiness
Employers reported the low induction period and improve the job performance for the Apprenticeship-Trained Higher, which contributes to more workforce efficiency and operational readiness.

Stability Relationship
While not tested here, qualitative insight from firms suggests that apprenticeship-defined employees better adapted to environmental-skilled practices and automation-supporting long-term stability.

Discussion
These findings strengthen the strategic role of the apprenticeship schemes in bridging the skill gap in India's automotive manufacturing industry, especially in a hub like Pune. The statistically significant difference in skill acquisition shows how practical risk, combined with metherip, enhances both technical and soft skills - lions and Reddy (2021) and Deshpande (2022) increase previous studies.

Retention results align with principles in organizational behavior that presents early engagement and structured onboarding as the key to the loyalty to the workforce. Trained trainees have invested time and effort under directed mentarships, to see the employers more favorablely and display high emotional commitment. It supports findings from Patil et al. (2020) and Verma and Kel (2019), where formal trainees led to better retention results.

Stability benefits are contained through low attention, operational efficiency and compatibility of green practices. These abstract contributions help motor vehicle firms to maintain continuity and reduce long-term recruitment costs-an aspect highlighted by Kulkarni and Mehta (2023).

VI. Conclusion

The study decisively indicates that the structured apparel schemes increase skill development and employee retention within Pune's motor vehicle manufacturing sector. Results validate the effectiveness of initiatives such as NAPS and MSME skills programs in preparing loyal and durable workforce for the future. As India pushes towards "Skill India" and sustainable industrial development, integrating the apprenticeship model in the core HR strategy is not only beneficial, but is essential for long -term competition and social impact.

Recommendations
- Increase outreach and awareness about apprenticeship plans between MSMEs.
- Digitize training assessment and align the course with industry 4.0 trends.
- Offer retention encouragement for trainees who complete the full duration.
- Include compliance in modules and training programs on green practices.
- Monitor the results through a national training performance dashboard.

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