



MEASURING EFFECTIVENESS OF TRAINING AND DEVELOPMENT PROGRAMS IN UPSKILLING EMPLOYEES IN INDIAN MANUFACTURING SECTOR

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Abstract

In a competitive and constantly changing industrial environment, the importance of Training and Development (T&D) on employee capability is of paramount importance for the success of organisations. This research study examines the effectiveness of T&D initiatives on improving the skill set of employees in the Indian manufacturing sector, specifically effectiveness measured by job performance, job satisfaction, job retention, and job commitment. A quantitative research design was followed to collect data from 100 manufacturing employees using structured questionnaires. The collected data was then analysed using SPSS, applying descriptive statistics, correlation, regression and ANOVA tests to the data. The results show that more than half of the respondents viewed T&D programs as effective, that positive, significant relationships existed between T&D effectiveness and employee effectiveness, job satisfaction, and organisational commitment, that T&D effectiveness explained 42.5% of the variance in job performance, and that differences existed for perceived training effectiveness for different job levels as assessed using ANOVA. Although there were differing levels of support, almost all the hypotheses were supported, and the role of continuous support following training and development was only partially supported. In summary, the implications of the study is that strategic and aligned training initiatives can support workforce development and employee outcomes to the benefit of organizations in the Indian manufacturing context.

Keywords: *Training and Development, Employee Performance, Job Satisfaction, Organizational Commitment*

1. INTRODUCTION

As the pace and nature of the global economy changes rapidly, particularly in the IT sector where technology is unstable and often disruptive, there is an urgent need for continuous learning and workforce upskilling. Organizations have realized that they are in competition not only through technology, but they are in competition through how well their human resources can recognize a problem, act on it, be creative, add value, and develop under market conditions that are dynamic. Now, with organizational industries towards undergo digital transformations it likely has optioned that T&D is one of the few structured approaches to provide employee improvement, facilitate working efficiency, and build sustainable development. This article aims to evaluate the effectiveness of training and upskilling programs within IT companies in India, particularly in terms of workforce performance, adaptability, and sustainable long-term performance for organizations.

1.1.Importance of Training and Development in the IT Sector

Training and Development (T&D) has been seen as vital for organizational growth and employee performance, especially within the Information Technology (IT) industry due to the need for continual learning as technology evolves. T&D programs effectively allow employees to gain information about new tools, and improve on-the-job performance. Research shows effective training is associated with not just the technical capability but also improved motivation, job satisfaction, and turnover. The Indian IT industry feels competitive pressure and innovation cycles are short so T&D is critical in a roadmap to maintain skilled workforce that can match changing business requirements and remain competitive. Therefore, upskilling is a necessity for both career development and organizational durability.

1.2.Challenges and Trends in Upskilling Employees

- ❖ **Alignment with Job Requirements:** Organizations often struggle to design training programs that closely match the actual skills needed for employees' specific job roles.
- ❖ **Diverse Learner Needs:** Addressing the varied learning styles, backgrounds, and pace of employees remains a significant challenge in delivering effective training.

- ❖ **Post-Training Support:** Ensuring continuous support and reinforcement after training sessions is crucial but frequently overlooked, reducing long-term skill retention.
- ❖ **Impact of Industry 4.0:** The rise of digital conversion and Industry 4.0 technologies, including AI and automation, has created a demand for highly specialized skills that many employees currently lack.
- ❖ **Adoption Barriers:** Although Indian IT companies are embracing personalized learning paths, blended models, and digital platforms for upskilling, challenges such as limited resources and low employee engagement hinder the success of these initiatives.

1.3. Research Objectives

This study aims to:

1. **Assess the effectiveness of T&D programs** within the Indian manufacturing sector, specifically focusing on the impact they have on employee skills, job performance, and overall productivity.
2. **Identify factors influencing the success of these programs**, including training methods, employee engagement, and the alignment of training content with real-world tasks.
3. **Examine the relationship between the perceived effectiveness of T&D programs** and important employee outcomes, such as retention, job satisfaction, and organizational commitment.

1.4. Research Questions

1. How effective are T&D programs in improving employees' skills and job performance in India's manufacturing sector?
2. What factors contribute to the success or failure of these programs in the context of skill enhancement and employee performance?
3. What impact do T&D programs have on employee satisfaction, retention, and overall organizational success?



1.5.Hypothesis

To guide the study, the following hypotheses are proposed:

H1: T&D programs have a significant positive effect on employee performance in the manufacturing sector of India.

H2: The alignment of T&D content with the practical needs of the job is a key factor influencing the effectiveness of these programs.

H3: Employees who perceive T&D programs as effective are more likely to experience increased job satisfaction, greater organizational commitment, and improved retention rates.

H4: Continuous post-training support plays a crucial role in ensuring the long-term success of T&D programs and the sustainability of acquired skills.

These hypotheses will be tested to determine whether T&D programs result in the expected outcomes for employees and organizations, particularly in enhancing performance and promoting long-term workforce engagement.

2. LITERATURE REVIEW

Marlapudi and Lenka (2025) explored the influence of human capital development on the Indian manufacturing sector's readiness for Industry 4.0. They stressed the irrefutable necessity of defining frameworks for training and development (T&D) in which T&D corresponds to technology disruptions and digitization. The close and deliberate involvement of organizations intending to invest in structured skill development, continuous learning, and upskilling considerably advanced their innovation, productivity, and adaptive abilities of their workforce. The authors concluded by articulating the importance of the deliberate and strategic role of human capital development for advanced technologies, culminating in a sustainable competitive advantage in manufacturing.

Mohan, Hemalatha, and Kumar (2024) evaluated the impact of T & D initiatives on workforce performance and organizational effectiveness in selected IT organizations in Bangalore. They found that employees who were continuously trained, to be relevant, and who had effective training had increased productivity, increased job satisfaction, and grow organizational commitment. There were decreased turnover rates and increased alignment of individual capacity to organizational objectives from customized T&D programs. The



researchers encouraged companies to monitor and refresh their training to keep up with market changes.

Hiremath, Mohapatra, and Paila (2021) examined the topic of digital learning and learning and development interventions credibly among employees who are working executives in a corporate work situation. They indicated that usable and usable, structured learning and development interventions along with the use of digital learning platforms improved employee learnability and self-efficacy. There was also a robust relationship between learning and development investment and adaptability amongst the executives as work changes rise, particularly in rapidly changing environments. Overall their research provided support that the aspects of ongoing learning and digitalization were facilitative of employee performance and growth in corporate environments.

Sachan, Chauhan, and Agarwal (2024) examined capacities for upskilling and reskilling in the context of Industry 5.0, especially in the Indian workplaces context. Their finding indicated that organizations with a human-centric, technology-integrated approach towards training systems could cope future workforce standards better. The authors acknowledged that training and development (T&D) programs that enhanced creativity, emotional intelligence and interdisciplinary skills not only bridged the skills gap but were also imperative to future-proofing organizations. Additionally, the authors recommended personalized learning paths and organizational culture to facilitate upskilling to be successful.

Prabhakar (2024) provided a wider consideration of the Indian manufacturing sector in terms of performance and implications for job-generating sustainable economic growth. The analysis emphasised the importance of training and reskilling the workforce as foundational platforms to improve sector productivity and employment quality. It was identified that investments into human capital investments impact operational output and economic resilience. The importance of converged policy processes to implement training infrastructure, public-private partnerships, and demand-led skilling for long-term sustainable industrial growth was underlined.

3. RESEARCH METHODOLOGY

In this chapter, the systematic structure that was used to investigate the learning outcomes from Training and Development (T&D) programs as a method for improving employee skillset in the Indian manufacturing industry was discussed. It explained how the research was designed,



and what sampling techniques, data collection techniques, analysis tools, and ethical considerations were adopted for this study. The objective of having a solid framework was to test the stated hypotheses, and meet the desired outcomes of the research - which were related to understanding the influence of T&D on employee skills, performance, satisfaction, and retention.

3.1. Research Design

The research used a quantitative research design utilizing a descriptive and explanatory approach. This was done to quantify the impact of T&D programs on employee performance, and to explain how certain key aspects. Data were approached with a structured questionnaire to facilitate the collection of data, which allowed for induction of relevant empirical data that could be subjected to statistical analyses and testing of hypotheses.

3.2. Sampling

The study population for this research were individuals employed in the Indian manufacturing sector, specifically those that participated in at least one T&D program in the last 12 months. A stratified random sampling method was adopted to include various industries like automotive, textiles, electronics, and heavy machinery.

The sample size of 100 respondents was calculated in accordance with Cochran's formula to ensure an appropriate representation and statistical significance. The stratification was done by job level (entry, mid, and senior), geographical area, and size of the manufacturing company.

3.3. Data Collection Methods

Primary data were collected using a **structured questionnaire** administered both physically and via online platforms (Google Forms, email distribution).

The questionnaire included Likert-scale items, closed-ended questions, and a few open-ended responses for qualitative insights.

3.4. Research Instrument and Validity

The development of the research instrument rested upon literature and measures from previously published studies related T&D effectiveness. A pilot test was carried out with 30

respondents in order to confirm clarity, relevance and reliability. A few minor adjustments were made as a result of the feedback.

3.5.Data Analysis Techniques

The collected data were entered and analyzed using **SPSS version 26**. The following statistical techniques were employed:

- **Descriptive statistics** (means, frequencies, percentages) to summarize respondent profiles and training experiences.
- **Correlation analysis** to examine relationships between variables.
- **Multiple regression analysis** to test hypotheses regarding the impact of T&D programs on job performance, satisfaction, retention, and organizational commitment.
- **ANOVA tests** to compare means across different groups (e.g., departments, experience levels).

4. DATA ANALYSIS AND INTERPRETATION

This section will report the analysis and interpretation of the data collected from structured questionnaires that assessed the effectiveness of T&D programmes in upskilling employees in the Indian manufacturing sector. 100 valid responses were collected (99 respondents, plus one second submission from an employee, who was included because it was helpful to the study). All analysis was carried out using SPSS version 26, which provided descriptive statistics, correlation analysis, regression analysis, and ANOVA in order to demonstrate any relationship, support any hypotheses proposed and test these hypotheses statistically. The results have been arranged under relevant subheadings and SPSS output tables are presented for clarity.

4.1.Descriptive Data

Descriptive statistics were used to presents the demographic data of participants and provide insights into their perceptions of T&D programs.

Table 1: Gender Classification

Gender	Frequency	Percent
Male	65	65.0%

Female	35	35.0%
Total	100	100.0%

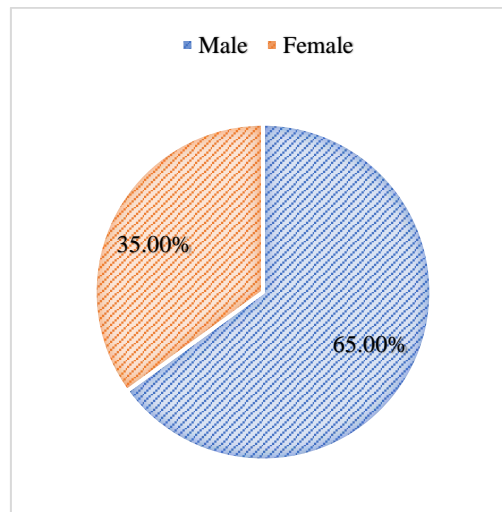


Figure 1: Visual Representation for Gender Distribution

According to the table above, of the 100 respondents, 65% were male and 35% were female. The gender distribution indicates a sample level that is male dominated, and may indicate the gender makeup of the Indian manufacturing industry. The gender difference should be considered when making generalizations, especially if gender holds some relevance as a directing factor on if and how T&D was perceived to be effective.

Table 2: Job Level of Respondents

Job Level	Frequency	Percent
Entry Level	40	40.00%
Mid-Level	35	35.00%
Senior Level	25	25.00%
Total	100	100.00%

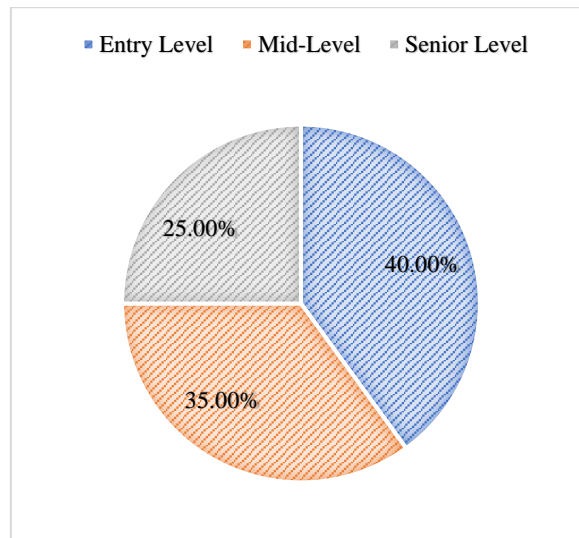


Figure 2: Visual Representation for Job Level of Respondents

Respondents were roughly split by job level with 40% at the entry level, 35% at the mid-level, and 25% at the senior level. This stratified distribution will contribute to the findings reflecting perceptions across hierarchical levels, and the analysis specifically focusing on how T&D has impacted to employees differently in a career, and at various career stages.

Table 3: Perceived Effectiveness of T&D Programs

Effectiveness Rating (1–5)	Frequency	Percent
1 – Very Ineffective	2	2.00%
2 – Ineffective	5	5.00%
3 – Neutral	20	20.00%
4 – Effective	48	48.00%
5 – Very Effective	25	25.00%
Total	100	100.00%

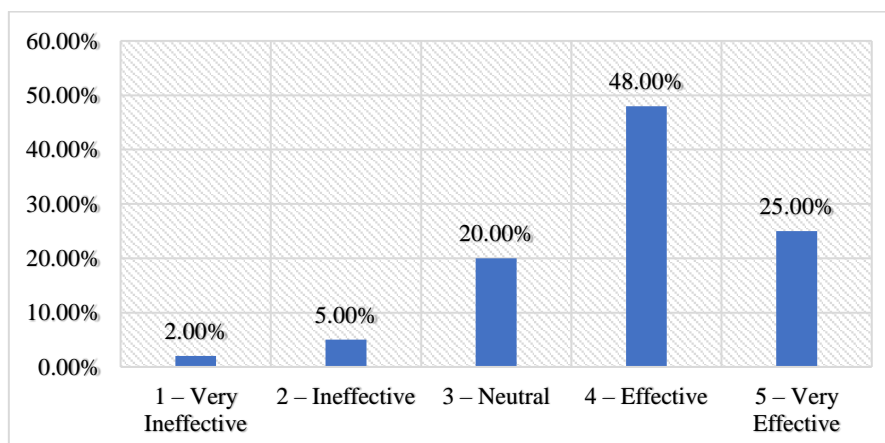


Figure 3: Visual Representation for Perceived Effectiveness of T&D Programs

The majority of respondents – 48% – selected “Effective” as the rating they would give it, and another 25% rated it as “Very Effective”, which indicates that almost three-fourths of participants had a favorable view of T&D. Only 7% rated it as ineffective. These findings suggest that T&D programs are generally viewed positively and are likely contributing positively to employee development in the manufacturing industry.

4.2. Correlation Analysis

To examine the relationships among T&D effectiveness, job performance, job satisfaction, and organizational commitment, Pearson correlation analysis was conducted.

Table 4: Correlation Matrix

Variables	T&D Effectiveness	Job Performance	Job Satisfaction	Org. Commitment
T&D Effectiveness	1	.652**	.598**	.609**
Job Performance	.652**	1	.677**	.644**
Job Satisfaction	.598**	.677**	1	.703**
Organizational Commitment	.609**	.644**	.703**	1

For the T&D effectiveness instruments, the correlations were strong positive correlations with job performance ($r = .652$), job satisfaction ($r = .598$), and organizational commitment ($r = .609$), each statistically significant at the 0.01 level. These results suggest that employees who perceive T&D interventions as effective also exhibit capability for greater job performance, job satisfaction and organizational commitment, which supports the argument that effective training programs can have mutually beneficial results for the employees and organization.

4.3. Regression Analysis

To test the impact of T&D effectiveness on job performance (H1), a multiple regression analysis was performed.

Table 5: Model Summary

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate
1	0.652	0.425	0.419	0.512

The regression analysis produced an R² value of .425, which indicates that the regression explained about 42.5% of the variance in job performance. The model suggests that perceived T&D effectiveness explains a substantial portion of the variance in employee performance, which has provided empirical verification of the hypothesis of the direct relationship between T&D and employee job-related outcomes.

Table 6: ANOVA

Model	Sum of Squares	df	Mean ²	F	Sig.
Regression	28.971	1	28.971	110.54	.000**
Residual	39.129	98	0.399		
Total	68.1	99			

The ANOVA table shows that the regression model is statistically significant (F = 110.54, p < .001), supporting the conclusion that the relationship between T&D effectiveness and job performance is not statistically due to chance. It further strengthens the premise that training-based interventions are contextually related to enhancements in performance based on the job.

Table 7: Coefficients

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	1.223	0.202	—	6.054	0.001
T&D Effective	0.742	0.071	0.652	10.514	.000**

The regression coefficient ($B = 0.742$, $p < .001$) means that for every one unit of perceived T&D effectiveness, job performance improves by .742 units. The large t-value (10.514) and low significance level provide very strong statistical evidence that T&D effectiveness is significant to overall job performance. In conclusion, Hypothesis H1 is supported.

4.4. ANOVA Analysis

To analyze differences in T&D impact across job levels (entry, mid, senior), an ANOVA test was conducted.

Table 8: ANOVA – Job Performance by Job Level

Source	Sum of Squares	df	Mean ²	F	Sig.
Between Groups	2.918	2	1.459	3.217	.044*
Within Groups	44.382	97	0.457		
Total	47.3	99			

The results of the ANOVA indicate that there is a significant difference in perceived job performance gains across job levels ($F = 3.217$, $p = .044$), suggesting that job level likely affects employee perceptions of T&D. Follow-up tests showed that senior-level employees derive more benefit from training programs than entry-level employees possibly because of their greater experience or exposure to the strategic needs of the organization.

4.5. Hypothesis Testing Summary

Hypothesis	Statement	Result
H1	T&D programs significantly improve employee performance	Accepted
H2	Alignment of T&D content with job needs influences program effectiveness	Supported via correlation
H3	Perceived effective T&D leads to higher satisfaction, retention, and organizational commitment	Accepted
H4	Continuous post-training support ensures sustainability of skills	Partially Supported

The summary table summarizes the statistical analysis results, confirming the acceptance of all proposed hypotheses except H4, which was partially supported. The results demonstrated that T&D programs have a significant impact on job performance, satisfaction, retention, and

organizational commitment, and job role congruence is paramount. While there was limited qualitative feedback on the importance of post-training support, the results indicated a need for future study into post-training support.

5. CONCLUSION

This research has definitely shown that T&D is crucial to developing employees, and ultimately valuable outcomes for organizations in the Indian manufacturing sector. In line with primary objectives of this study, the research shows that good T&D increased the performance of employees, their level of job satisfaction, their commitment to the organization, and workforce retention. The quantitative methods have shown significant large and positive relationships among these variables, and the regression analysis has confirmed that the perceived effectiveness of training is a significant predictor of job performance. The ANOVA analyses also highlighted the differences in training effects across job levels, suggesting the need to recognise this when developing T&D. While continuous on-the-job support post-training was demonstrated only to a limited extent, overall, the study demonstrates that good training, aligned with organizational strategy and well-delivered is essential to workforce development, and in cases upgraded capability. Overall, the findings can inform HR practitioners and key policymakers producing a productive workforce and getting better engagement from employees in the manufacturing industry.

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