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A Study on Training Need Analysis in the Rope Manufacturing Industry

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ABSTRACT: Training Need Analysis (TNA) is a systematic, multi-step process of identifying the gap between current employee competencies and the performance levels required to meet organizational objectives, enabling organizations to design targeted, cost-effective, and strategically aligned training interventions. This empirical study investigates TNA practices in the rope manufacturing sector, Aurangabad, Maharashtra, India. A structured Likert-scale questionnaire (5-point scale, 17 items) was administered to $N = 100$ employees using simple random sampling (January–March 2025). Data were analyzed using Percentage Analysis, Chi-Square Test (χ^2), Wilcoxon Signed Ranks Test, and Pearson's Coefficient of Correlation. The Wilcoxon Test confirmed a statistically significant performance gap ($Z = -7.664, p < 0.001$). A strong positive correlation was found between transparent TNA procedures and customized training design ($r = +0.782, t = 12.41, df = 98, p < 0.05$). Communication skills (37%) emerged as the most critical training deficiency. The study provides a replicable TNA framework for manufacturing SMEs and actionable recommendations for HR practitioners.

KEYWORDS: Communication Skills Training; Competency Mapping; Employee Performance; Human Resource Development; Pearson Correlation; Skill Gap Analysis; Training Need Analysis (TNA); Wilcoxon Signed Ranks Test

I. INTRODUCTION

In the contemporary manufacturing environment, human capital is the most strategically critical organizational resource. The rope manufacturing sector demands precise technical skills, safety compliance, and continuous workforce development. Yet, empirical studies examining Training Need Analysis (TNA) within this sector remain scarce in the management literature [1].

TNA is defined as the systematic investigation of the gap between desired organizational performance and current employee performance, aimed at determining whether training is an appropriate and cost-effective intervention [2], [3]. Without TNA, organizations risk investing in programs that address the wrong problems, yielding negative returns on training expenditure [4].

The study objectives are: (i) to understand the types of training needs among employees; (ii) to statistically measure the performance gap; (iii) to establish the relationship between TNA procedures and training design; and (iv) to provide evidence-based recommendations for a competency-based TNA framework.

II. LITERATURE REVIEW

2.1. Theoretical Foundations of TNA

Boydell and Leary [6] established TNA as the foundational prerequisite for all training undertakings. Wills [7] described TNA as a multi-step process: gap identification → training design → execution → post-training evaluation. Goldstein and Ford [2] proposed the widely adopted three-level framework — organizational, task, and individual — while Noe [8] reinforced competency mapping as a reliable TNA method.

2.2. TNA in Organizational Practice

Sarkar [10] demonstrated that in many Indian SMEs, training selection is arbitrary and driven by managerial preference rather than systematic assessment — leading to poor training ROI. Reed and Vakola [13] noted that organizational culture shapes TNA processes, and cultural factors are frequently overlooked. Phillips [17] argued that management-driven training without genuine TNA consistently fails to deliver value.

2.3. Empirical Evidence on TNA Effectiveness

Salas et al. [9], through meta-analysis, confirmed that multi-method TNA significantly enhances training effectiveness. Bennett, Edens and Bell [4], analyzing 500+ training studies, established that systematic TNA strongly correlates with training ROI. Gupta [12] recommended combining surveys, interviews, observation, and appraisals for accuracy in manufacturing contexts.

3. METHOD

3.1. Research Design and Data Collection

Descriptive Research Design was adopted. Primary data was collected through a structured 5-point Likert-scale questionnaire (17 items) administered to 100 employees Rope Manufacturing Industry. using Simple Random Sampling (January–March 2025). Secondary data included company documents, HR policy brochures, and published academic literature.

3.2. Hypotheses

Four hypotheses were formulated and tested at $\alpha = 0.05$:

H1₀: No significant relationship between gender and training need perception.

H2₀: No significant relationship between employment type and initial training receipt.

H3₀: No significant relationship between transparent TNA procedure and customized training schedule.

H4₀: No significant gap between expected and actual employee performance.

IV. RESULTS

4.1. Demographic Profile of Respondents

The sample was gender-balanced (50% male, 50% female). Table-1 presents the full demographic distribution.

Table-1: Demographic Distribution of Respondents (N = 100)

Variable	Category	Frequency	Percentage (%)
Gender	Male	50	50%
	Female	50	50%
Age Group	20–30 years	53	53%
	30–40 years	25	25%
	40–50 years	11	11%
	50+ years	11	11%
Education	Post Graduation	58	58%
	Graduation	36	36%
	UG / Diploma	6	6%
Employment	Full-Time	92	92%
	Part-Time	8	8%

Gender Distribution of Respondents

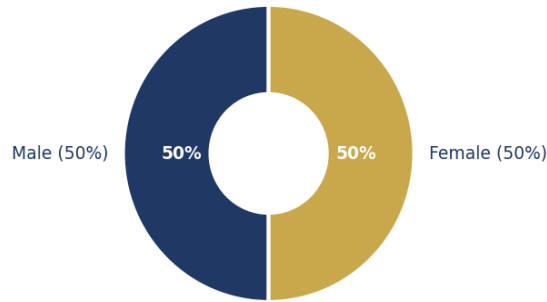


Figure-1: Gender Distribution of Respondents

Age Distribution of Respondents

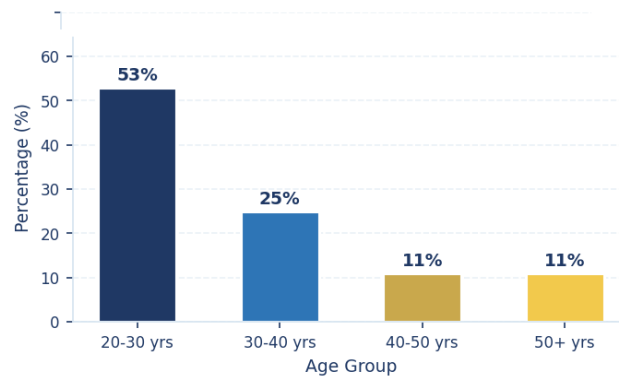


Figure-2: Age Distribution of Respondents

Educational Qualification of Respondents

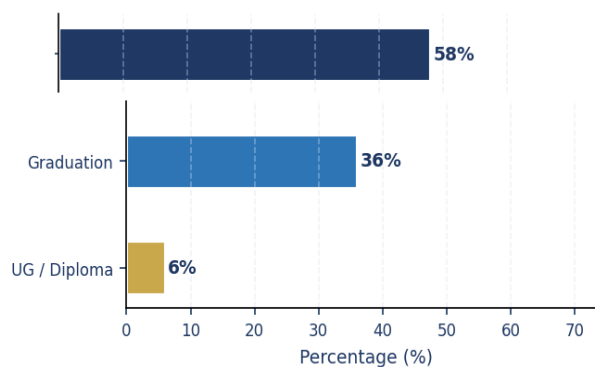


Figure-3: Educational Qualification of Respondents

The majority (53%) belong to the 20–30 age group, reflecting a young workforce. Post-graduates constitute 58%, appropriate for the technical demands of the sector. 92% are full-time employees, ensuring data reliability for training-practice analysis.

4.2. Training Practice Perceptions

Table-2 presents the Likert-scale response distribution across seven key training practice variables. Positive responses (SA+A) consistently exceed 74% across all items, confirming a supportive training culture.

Table-2: Likert Scale Response Summary on Training Practices (N = 100)

Variable	SA %	A %	N %	D %	SD %	SA+A %
Management care for training needs	7	70	17	2	4	77
Induction training for new employees	18	57	18	2	5	75
Transparent TNA procedure followed	12	62	17	5	4	74
Customized training schedule prepared	13	63	17	5	2	76
Training for innovation & thinking	17	62	15	4	2	79
Training before new assignments	20	58	17	3	2	78
Knowledge training for career growth	27	61	10	0	2	88

SA = Strongly Agree; A = Agree; N = Neutral; D = Disagree; SD = Strongly Disagree

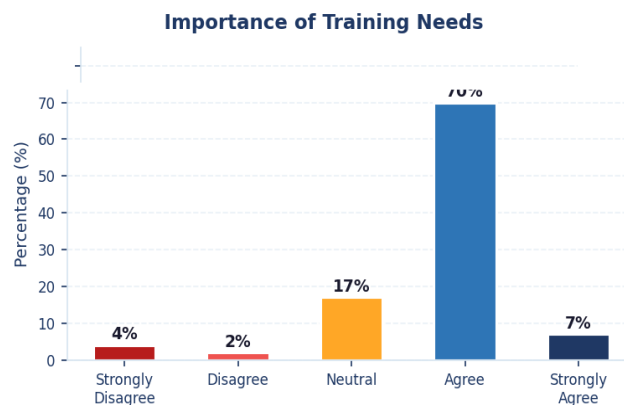


Figure-4: Perception on Importance of Training Needs

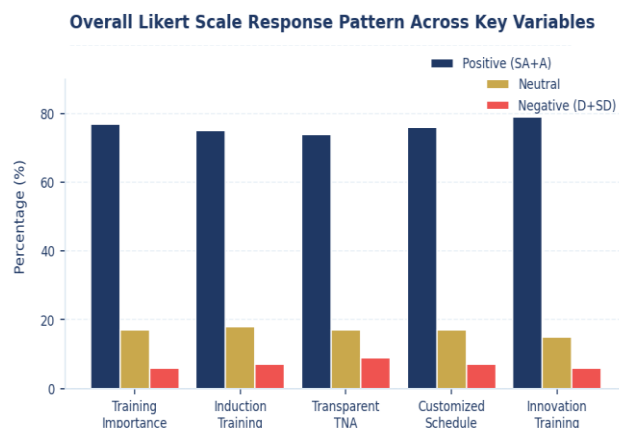


Figure-5: Overall Likert Response Pattern Across Key Training Variables

4.3. Priority Training Areas

Table-3: Areas of Training Required for Better Performance (N = 100)

Training Area	Respondents	Percentage (%)
Communication Skills	37	37%
Interpersonal Skills	25	25%
Knowledge Transfer	25	25%
Performance Training	12	12%
Physical & Psychological Stress Relief	1	1%
Total	100	100%

Areas of Training Required for Better Performance

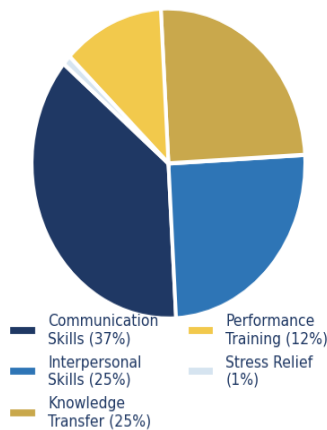


Figure-6: Priority Training Areas Required for Better Performance

Methods to Solve Work-Related Problems

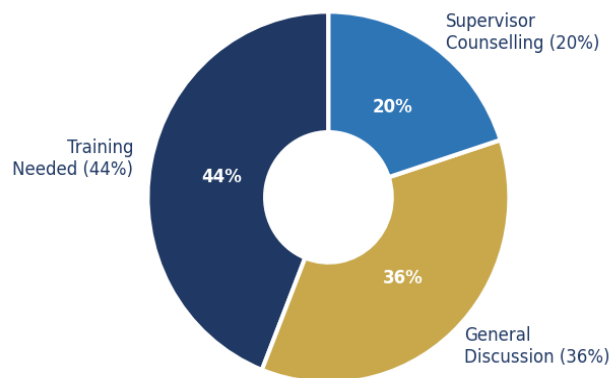


Figure-7: Preferred Methods for Solving Work-Related Problems

Communication skills (37%) is the highest-priority training area. 44% of employees prefer training as their primary method for solving work-related problems, validating training's perceived utility as an organizational problem-solving tool [12].

4.4. Hypothesis Testing

H1 (Chi-Square — Gender vs Training Perception): $\chi^2 = 0.07 < \text{critical } 5.991 \text{ (df = 2)}$. H1₀ Not Rejected — no significant gender difference in training perception.

H2 (Chi-Square — Employment Type vs Initial Training): $\chi^2 = 0.86 < \text{critical } 3.841 \text{ (df = 1)}$. H2₀ Not Rejected — equitable training access across employment types.

H3 (Pearson's r — TNA Procedure vs Customized Schedule): $r = +0.782$; $t = 12.41 > \text{critical } 1.984 \text{ (df = 98)}$. H3₀ Rejected — statistically significant strong positive relationship confirmed.

H4 (Wilcoxon — Expected vs Actual Performance): 77 positive ranks (mean = 41.18, sum = 3,171), 3 negative ranks, 20 ties. $Z = -7.664$, $p = 0.000 < 0.001$. H4₀ Rejected — significant performance gap confirmed.

Table-4: Summary of All Hypothesis Testing Results

H	Hypothesis	Test	Calculated	Critical Value	Decision	p
H1	Gender & Training Perception	χ^2	0.07	5.991, df=2	Not Rejected	> 0.05
H2	Employment Type & Initial Training	χ^2	0.86	3.841, df=1	Not Rejected	> 0.05
H3	TNA Procedure & Customized Schedule	Pearson r+t	t=12.41	1.984, df=98	Rejected **	< 0.05
H4	Expected vs Actual Performance Gap	Wilcoxon	Z=-7.664	p < 0.001	Rejected ***	0.000

** p < 0.05; *** p < 0.001

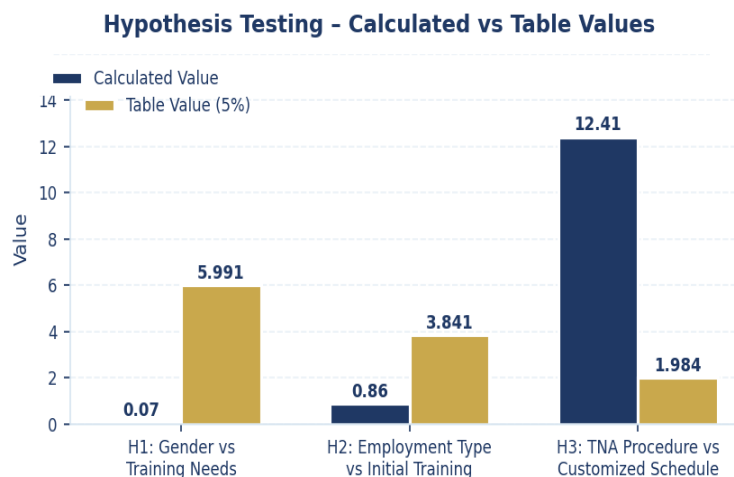


Figure-8: Hypothesis Testing — Calculated vs Critical Values

V. DISCUSSION

The statistically significant performance gap ($Z = -7.664$, $p < 0.001$) The strong positive correlation ($r = +0.782$, $t = 12.41$, $p < 0.05$) between transparent TNA procedures and customized training design confirms Goldstein and Ford's [2] three-level framework: organizations that rigorously diagnose training needs design significantly more effective programs.

Communication skills (37%) and interpersonal skills (25%) dominate training deficiencies, consistent with Gupta [12], reflecting the multi-stakeholder communication demands of an export-oriented manufacturer. 32% of employees lacked initial job-profile-specific training, directly explaining the H4 performance gap. 77% preference for hands-on training aligns with experiential learning evidence by Salas et al. [9].

VI. FUTURE SCOPE

- ▶ Longitudinal pre/post-training performance measurement to assess actual productivity and quality impact of TNA-driven interventions.
- ▶ Multi-site comparative TNA studies across rope and cordage manufacturing organizations in India to identify sector-wide training patterns.
- ▶ Integration of digital learning analytics and competency mapping with traditional TNA survey methodologies for real-time needs assessment.

VII. CONCLUSION

This study provides robust empirical evidence of both the strengths and critical gaps in TNA practices within the rope manufacturing sector. While a broadly positive training culture exists (74–88% positive Likert responses), the Wilcoxon Test ($Z = -7.664$, $p < 0.001$) confirms that actual employee performance systematically falls below organizational expectations.

The Pearson's correlation ($r = +0.782$, $t = 12.41$, $p < 0.05$) validates systematic needs assessment as the foundational driver of training effectiveness. Three immediate HR priorities emerge: (i) mandatory job-profile-specific initial training for all recruits, closing the 32% coverage gap; (ii) targeted communication and interpersonal skills programs; and (iii) hands-on practical training formats preferred by 77% of the workforce.

This research contributes a replicable, cost-effective, survey-based TNA framework applicable across specialized manufacturing SMEs in India and comparable developing-economy contexts.

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