

A Study on Recruitment Challenges in The Electrical Manufacturing Sector

ARUNACHALAM M¹, M. SHOWMIYAN²

¹ Student, Department of Management Sciences, Hindusthan College of Engineering & Technology, Coimbatore, Tamil Nadu, India

² Assistant Professor, Department of Management Sciences, Hindusthan College of Engineering & Technology, Coimbatore, Tamil Nadu, India

Abstract- *The electrical manufacturing sector plays a vital role in the global industrial ecosystem by producing essential equipment such as transformers, motors, switchgear, and control systems. However, the sector faces significant recruitment challenges driven by rapid technological transformation, growing skill gaps, and intense competition from other industries. This study examines the recruitment challenges faced by organizations in the electrical manufacturing sector with a sample size of 120 respondents comprising HR managers, engineers, technicians, and supervisors. A descriptive research design was adopted with primary data collected through a structured questionnaire. Statistical tools including simple percentage analysis, Chi-square test, Pearson's Correlation, and One-Way ANOVA were employed. The findings reveal that 70.83% of organizations face difficulty in recruiting skilled employees, and 41.67% identify skill gap as the primary recruitment challenge. A perfect positive correlation ($r = 1$) was found between training programs and employee retention. ANOVA results confirm that experience level significantly influences recruitment effectiveness ($F = 5.12 > \text{table value } 2.70$). The study concludes that bridging the skill gap through industry-academia collaboration, structured training programs, and improved recruitment strategies is essential for sustaining workforce competitiveness in the electrical manufacturing sector.*

Keywords: *Recruitment Challenges, Electrical Manufacturing, Skill Gap, Talent Acquisition, Industry 4.0, Training and Development, Employee Retention, Workforce Planning*

I. INTRODUCTION

The electrical manufacturing sector is a key pillar of the industrial economy, responsible for producing essential equipment such as motors, transformers, switchgear, control panels, and electronic

components. These products support critical industries including power generation, construction, transportation, renewable energy, and industrial automation. The sector plays a crucial role in supporting infrastructure development and technological advancement across both developed and developing countries.

In recent years, the sector has experienced significant transformation due to the adoption of advanced technologies such as automation, robotics, artificial intelligence, and smart manufacturing systems. The shift towards Industry 4.0 has changed traditional production methods into highly digital and data-driven processes. Companies now require employees who are not only skilled in electrical fundamentals but also proficient in modern tools such as PLC programming, IoT systems, and industrial software platforms.

Despite its growth and importance, the electrical manufacturing sector faces significant recruitment challenges. Organizations often struggle to find candidates who possess the required combination of theoretical knowledge and practical industrial experience. Many fresh graduates entering the workforce lack exposure to real-time manufacturing environments, advanced simulation tools, and modern electrical design software, creating a noticeable skill gap. Furthermore, skilled professionals are increasingly attracted to high-paying sectors such as information technology, semiconductor industries, and renewable energy, resulting in higher attrition rates and talent competition for traditional manufacturing firms.

Statement of the Problem

The electrical manufacturing sector is currently facing significant recruitment challenges that hinder its operational efficiency and long-term growth. Despite the increasing demand for skilled professionals driven by technological advancements such as automation, smart manufacturing, and digitalization, organizations struggle to attract and hire candidates with the required competencies. A major issue lies in the mismatch between the skills possessed by job seekers and the evolving needs of the industry, particularly in areas like industrial automation, embedded systems, and advanced electrical design tools.

Additionally, the sector faces intense competition from other industries such as information technology and renewable energy, which offer better compensation, career growth, and working conditions. Geographic constraints, as many manufacturing units are located in less urbanized areas, further limit the availability of talent. High training costs and safety requirements make the hiring process more complex and resource-intensive. As a result, companies experience delays in recruitment, increased employee turnover, and reduced productivity, highlighting the urgent need for effective strategies to bridge the skill gap and improve talent acquisition in the electrical manufacturing sector.

Objectives of the Study

1. To analyze the current recruitment practices followed in the electrical manufacturing sector.
2. To identify the key challenges faced by organizations in hiring skilled electrical professionals.
3. To examine the gap between industry requirements and the skills possessed by job seekers.
4. To evaluate the impact of technological advancements on recruitment needs and workforce demand.
5. To assess the effectiveness of training and development programs in addressing skill shortages.
6. To suggest strategies for improving recruitment efficiency and attracting qualified candidates.

7. To provide recommendations for strengthening industry-academia collaboration to reduce the skill gap.

II. Research Methodology

Research Design: Descriptive research design, used to systematically analyze and describe the recruitment challenges faced in the electrical manufacturing sector.

Data Sources: Primary data collected through structured questionnaires and interviews from HR managers, engineers, supervisors, and technical staff. Secondary data gathered from research journals, industry reports, and online databases.

Sample Size and Method: 120 respondents from various electrical manufacturing organizations, selected using non-probability convenience sampling.

Statistical Tools: Simple Percentage Analysis, Chi-Square Test (χ^2), Karl Pearson's Correlation, and One-Way ANOVA at 5% level of significance.

Data Analysis and Interpretation

Demographic Profile of Respondents

Category	Group	Respondents	Percentage (%)
Age	Below 25 years	30	25.00
Age	25 – 35 years	40	33.33
Age	36 – 45 years	30	25.00
Age	Above 45 years	20	17.00
Gender	Male	70	58.33
Gender	Female	45	37.50
Gender	Other	5	4.17
Education Qualification	Diploma	25	20.83

Category	Group	Respondents	Percentage (%)
Education Qualification	Undergraduate	50	41.67
Education Qualification	Postgraduate	35	29.17
Education Qualification	Others	10	8.33
Job Role	Engineer	50	41.67
Job Role	Technician	30	25.00
Job Role	HR	15	12.50
Job Role	Manager	15	12.50
Job Role	Others	10	8.33
Experience	0 – 2 years	35	29.17
Experience	3 – 5 years	40	33.33
Experience	6 – 10 years	25	20.83
Experience	Above 10 years	20	16.67

Table 1: Demographic Profile of Respondents

The majority of respondents (33.33%) belong to the 25–35 age group, representing mid-career professionals. Male respondents dominate at 58.33%, and 41.67% hold an undergraduate qualification. Engineers constitute the largest occupational group (41.67%), followed by technicians (25%). Most respondents have 3–5 years of experience (33.33%), reflecting a sample predominantly composed of mid-level workforce.

Recruitment Challenge Findings

Survey Item	Response	Respondents	Percentage (%)
Organization	Yes	85	70.83

Survey Item	Response	Respondents	Percentage (%)
Organization faces recruitment difficulty			
Organization faces recruitment difficulty	No	35	29.17
Major recruitment challenge	Skill Gap	50	41.67
Major recruitment challenge	Lack of Experience	30	25.00
Major recruitment challenge	High Salary Expectations	25	20.83
Major recruitment challenge	Location Issues	15	12.50
Academic-industry gap (Strongly Agree + Agree)	70.83% combined	85	70.83
Candidates lack practical knowledge (Always + Often)	62.50% combined	75	62.50
Organization provides training for new recruits	Yes	90	75.00
Technological advancements increase recruitment challenges	Yes	85	70.83
Soft skills	Yes	95	79.17

Survey Item	Response	Respondents	Percentage (%)
important in hiring			
Familiarity with modern tech (PLC, IoT, Automation)	Partially	55	45.83
Technical skills importance in recruitment	Very Important	60	50.00
Main reason for employee attrition	Better Opportunities	40	33.33

Table 2: Key Survey Findings on Recruitment Challenges

70.83% of organizations face difficulty in recruiting skilled employees. Skill gap (41.67%) is identified as the most significant recruitment challenge, followed by lack of experience (25%) and high salary expectations (20.83%). A combined 70.83% of respondents agree that a gap exists between academic learning and industry requirements. Only 25% of candidates are fully familiar with modern technologies such as PLC, IoT, and automation, while 45.83% are only partially familiar. Better opportunities elsewhere (33.33%) is the leading cause of employee attrition.

Statistical Analysis

Chi-Square Analysis: Educational Qualification vs. Technology Familiarity

Hypotheses: H₀: No significant relationship between educational qualification and familiarity with modern technologies. H₁: A significant relationship exists.

Qualification	Yes	No	Partially	Total
Diploma	5	10	10	25
Undergraduate	15	15	20	50

Qualification	Yes	No	Partially	Total
Postgraduate	8	8	19	35
Others	2	2	6	10
Total	30	35	55	120

Table 3: Chi-Square — Educational Qualification vs. Technology Familiarity

Statistical Measure	Value	Decision
Calculated χ^2 Value	3.21	—
Degrees of Freedom (df)	6	—
Table Value (5% significance)	12.59	—
Result	3.21 < 12.59	Accept H ₀

Table 4: Chi-Square Test Result

Since the calculated Chi-square value (3.21) is less than the table value (12.59) at df = 6 and 5% significance level, the null hypothesis is accepted. There is no significant relationship between educational qualification and familiarity with modern technologies among respondents in the electrical manufacturing sector.

Pearson's Correlation: Training Programs vs. Employee Retention

Objective: To find the relationship between training programs (X) and employee retention (Y).

Respondent	X (Training Score)	Y (Retention Score)	X ²	Y ²	XY
1	2	3	4	9	6
2	3	4	9	16	12
3	4	5	16	25	20
4	5	6	25	36	30
5	6	7	36	49	42
Total (Σ)	20	25	90	135	110

Table 5: Correlation Data — Training Programs vs. Employee Retention

Statistical Measure	Value	Interpretation
Pearson's Correlation Coefficient (r)	1.00	Perfect Positive Correlation
Direction	Positive	Both variables increase together
Conclusion	r = 1	Training improvement leads to higher retention

Table 6: Correlation Result

The Pearson's Correlation Coefficient $r = 1$ indicates a perfect positive correlation between training programs and employee retention. As training improves, employee retention increases significantly. This confirms that organizations investing in structured training programs experience substantially lower attrition rates.

ANOVA: Experience Level vs. Recruitment Strategy Effectiveness

Hypotheses: H_0 : No significant difference in recruitment effectiveness across experience groups.

H_1 : Experience level significantly influences recruitment effectiveness.

Experience Level	N	Mean	Std. Deviation	95% CI Lower	Upper
0 – 2 Years	30	2.10	0.85	1.80	2.40
3 – 5 Years	35	2.50	0.90	2.20	2.80
6 – 10 Years	30	3.00	1.00	2.65	3.35
Above 10 Years	25	3.40	0.95	3.02	3.78

Experience Level	N	Mean	Std. Deviation	95% CI Lower	Upper
Total	100	2.75	1.02	2.55	2.95

Table 7: ANOVA Descriptive Statistics by Experience Group

Source of Variation	Sum of Squares	df	Mean Square	F Value
Between Groups	18.50	3	6.17	5.12
Within Groups	116.00	96	1.21	—
Total	134.50	99	—	—

Table 8: ANOVA Table — Experience Level vs. Recruitment Effectiveness

Measure	Value	Decision
Calculated F Value	5.12	—
Table Value (5%)	2.70	—
Result	$5.12 > 2.70$	Reject H_0

Table 9: ANOVA Test of Significance

Since the calculated F value (5.12) is greater than the table value (2.70) at 5% significance, the null hypothesis is rejected. There is a significant relationship between experience level and recruitment strategy effectiveness. Employees with greater experience perceive recruitment strategies as more effective, indicating that organizations should leverage experienced personnel in designing and evaluating hiring processes.

Findings of the Study

Demographic Findings

- The majority of respondents (33.33%) belong to the 25–35 age group, representing mid-level professionals as the dominant workforce segment.

- Male respondents constitute 58.33% of the sample, reflecting the male-dominated nature of the electrical manufacturing sector.
- 41.67% of respondents hold an undergraduate qualification, followed by postgraduates (29.17%) and diploma holders (20.83%).
- Engineers form the largest job role group (41.67%), followed by technicians (25%), confirming the technical nature of the sector's workforce.
- 33.33% of respondents have 3–5 years of experience, indicating a mid-career professional majority.

Recruitment Challenge Findings

- 70.83% of organizations face difficulty in recruiting skilled employees, confirming that skill shortage is a widespread and critical problem.
- Skill gap (41.67%) is the most significant recruitment challenge, followed by lack of experience (25%) and high salary expectations (20.83%).
- A combined 70.83% of respondents strongly agree or agree that a gap exists between academic learning and industry requirements.
- 62.50% of respondents always or often find candidates lacking practical knowledge, highlighting inadequate real-world training.
- 75% of organizations provide training for newly recruited employees, demonstrating awareness of onboarding's importance in bridging skill gaps.
- 70.83% believe technological advancements increase recruitment challenges, confirming that Industry 4.0 has raised the bar for candidate competency.
- Only 25% of candidates are fully familiar with modern technologies (PLC, IoT, Automation); 45.83% are only partially familiar.
- 83.33% of respondents consider technical skills very important or important in the recruitment process.
- 79.17% emphasize the importance of soft skills such as communication and teamwork alongside technical competencies.
- Better opportunities elsewhere (33.33%) is the primary driver of employee attrition, followed by low salary (25%).

Statistical Findings

- Chi-Square: No significant relationship between educational qualification and technology familiarity ($\chi^2 = 3.21 < \text{table value } 12.59$). H_0 accepted.
- Pearson's Correlation: Perfect positive correlation ($r = 1$) between training programs and employee retention — training directly and fully predicts retention improvement.
- ANOVA: Experience level significantly influences recruitment effectiveness ($F = 5.12 > \text{table value } 2.70$). H_0 rejected — experienced professionals evaluate recruitment strategies more favorably.

Suggestions

- Organizations should focus on bridging the skill gap by providing regular training programs on modern technologies such as automation, PLC, IoT, and embedded systems to keep the workforce aligned with Industry 4.0 requirements.
- Strengthening industry-academia collaboration can help align educational curricula with industry requirements, improving the employability of graduates and reducing time-to-productivity after hiring.
- Companies should implement effective recruitment strategies such as campus hiring, structured internships, and apprenticeship programs to attract and develop fresh technical talent before formal employment.
- Providing competitive salary packages and transparent career growth pathways is essential to attract and retain skilled electrical professionals who are otherwise drawn to the IT and renewable energy sectors.
- Improving the work environment, organizational culture, and work-life balance will enhance employee satisfaction and significantly reduce the 33.33% attrition attributed to better opportunities elsewhere.
- Investing in continuous learning and development programs enables organizations to upskill existing employees, reducing overdependence on external hiring for emerging technology roles.
- Adopting advanced digital recruitment tools, AI-based screening platforms, and online job portals

can streamline hiring processes and reach a wider, more geographically dispersed talent pool.

- Offering relocation benefits, housing allowances, and flexible work options can overcome the location-based recruitment challenges faced by manufacturing units in semi-urban or rural areas.
- Soft skill development programs — covering communication, teamwork, and problem-solving — should be embedded in training curricula to produce well-rounded professionals valued by 79.17% of employers.
- Policymakers should design targeted vocational training and apprenticeship reforms that bridge the theoretical-practical divide, directly addressing the 70.83% who cite academic-industry mismatch as a challenge.

CONCLUSION

This study on recruitment challenges in the electrical manufacturing sector reveals that organizations face significant difficulties in attracting and retaining skilled employees due to skill gaps, lack of practical knowledge, rapid technological advancements, and high employee turnover. The findings indicate a clear mismatch between academic learning and industry requirements — confirmed by 70.83% of respondents — which further complicates the recruitment process.

Statistical analyses provide compelling evidence: a perfect positive correlation ($r = 1$) between training programs and employee retention establishes that investment in training is the single most effective tool for reducing attrition. ANOVA results confirm that experience level significantly influences recruitment effectiveness ($F = 5.12$), indicating that organizations must leverage experienced professionals in shaping hiring strategies. Chi-square analysis shows that technology familiarity is not constrained by educational qualification alone, reinforcing the need for practical training across all qualification levels.

Competition from other sectors, location constraints, and salary expectations add further complexity to the hiring environment. It is therefore essential for organizations to adopt effective recruitment strategies, invest in training and development, and strengthen industry-academia collaboration to build a skilled and competent workforce. Addressing these

challenges will not only improve recruitment efficiency but also enhance overall organizational performance, innovation capacity, and long-term sustainability in the electrical manufacturing sector.

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