

A STUDY ON SKILL GAP AND LABOUR CHALLENGES IN A MECHANICAL MANUFACTURING COMPANY

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ABSTRACT

This study titled “**A Study on Skill Gap and Labour Challenges in a Mechanical Manufacturing Company**” examines the existing skill gaps and labour-related challenges affecting productivity and operational efficiency. The research identifies discrepancies between required technical competencies and employees’ current skill levels, evaluates the effectiveness of training programs, and analyses labour challenges such as workforce shortages and communication barriers.

A descriptive research design was adopted, and primary data were collected from 75 respondents using a structured questionnaire. Statistical tools including Percentage Analysis, Chi-Square Test, One-Way ANOVA, and Pearson Correlation were applied for data analysis. The findings indicate that educational qualification and employment type significantly influence perceptions of training effectiveness, skill development, and work environment factors. Strong correlations were observed among training adequacy, technical competence, and operational efficiency variables. However, work experience did not show significant differences in perceptions related to labour challenges.

This study concludes that structured training programs, targeted skill development initiatives, improved communication mechanisms, and strategic workforce planning are critical to minimizing skill gaps and enhancing overall organizational performance.

Index Terms – Skill Gap, Labour Challenges, Manufacturing Sector, Workforce Productivity, Technical Skills.

I. INTRODUCTION

Introduction to the study

The mechanical manufacturing industry plays a vital role in industrial and economic development by supplying essential components and machinery to sectors such as automotive, construction, energy, and heavy engineering. With rapid technological advancements, automation, and the adoption of computer-aided manufacturing systems, the industry is undergoing significant transformation. While these developments have improved productivity and operational efficiency, they have also increased the demand for a highly skilled and adaptable workforce.

From a Human Resource Management (HRM) perspective, employees are strategic assets whose competencies directly influence organizational performance. Effective HR practices such as manpower planning, recruitment and selection, training and development, and performance management are essential to ensure that employees possess the required technical and behavioural skills. In manufacturing organizations, the alignment between job requirements and employee capabilities is critical for maintaining production quality, minimizing errors, and enhancing efficiency.

A major HR issue in mechanical manufacturing companies is the presence of skill gaps, which refer to the mismatch between required job competencies and the actual skills possessed by employees. These gaps are often observed in areas such as CNC operations, advanced machine handling, maintenance, quality control, and safety compliance. In addition, labour-related challenges including shortage of skilled workers, high turnover, absenteeism, and low employee engagement further affect workforce stability and productivity.

This study titled “**A Study on Skill Gap and Labour Challenges in a Mechanical Manufacturing Company**” focuses to examine the nature and extent of skill deficiencies and labour issues from an HR perspective. This study aims to analyse their impact on employee performance and organizational outcomes and to suggest HR-based measures for improving training effectiveness, workforce planning, and overall productivity.

Industry profile

The global mechanical manufacturing industry is a key pillar of industrial development, supplying machinery, equipment, and engineering components to sectors such as automotive, aerospace, construction, energy, and defence. The industry has evolved rapidly with the adoption of automation, CNC machines, robotics, and Industry 4.0 technologies, improving productivity and precision. However, this technological shift has also created significant workforce challenges, including shortages of skilled technicians, ageing labour forces in developed nations, and increasing demand for multi-skilled employees.

In India, the mechanical manufacturing industry plays a vital role in economic growth and employment generation. Supported by initiatives such as Make in India and Skill India, the sector contributes significantly to engineering goods production and exports. Despite having a large labour force, Indian manufacturers face major skill gaps due to limited practical training, outdated technical education, and inadequate exposure to modern manufacturing technologies. Labour challenges such as high attrition, migration to service sectors, and informal employment practices further affect productivity and operational efficiency, especially in small and medium enterprises.

Tamil Nadu is one of India’s leading states in mechanical and engineering manufacturing, known for its strong industrial infrastructure and skilled workforce. The state hosts a wide range of engineering industries including automobile manufacturing, auto components, machine tools, pumps, and heavy engineering. While Tamil Nadu has a relatively better skill ecosystem compared to other states, industries still face challenges related to rapid technological changes, shortage of highly skilled technicians, and increasing labour costs. Many organizations struggle to continuously upgrade employee skills to meet evolving industry requirements.

Coimbatore often referred to as the “Engineering Hub of South India,” is a major centre for mechanical manufacturing and engineering enterprises. The city is well known for its concentration of small and medium-scale industries involved in machine tools, textile machinery, pumps, motors, and precision components. Coimbatore’s industries benefit from entrepreneurial culture and technical expertise, but they also face challenges such as skill mismatches, shortage of trained manpower, and difficulty in retaining skilled workers. These issues make skill gap analysis and effective labour management essential for sustaining industrial growth in the region.

Company profile

This study was conducted in a medium-scale mechanical manufacturing firm located in Coimbatore, Tamil Nadu. The organization operates in precision machining and component manufacturing and employs approximately 150 workers. Primary data were collected from a sample of 75 employees representing production, maintenance, quality control, and supervisory levels. The selected setting provides an appropriate context for examining skill gaps and labour challenges within small-to-medium precision manufacturing firms.

Scope of the study

The Scope of this study is limited to analysing the skill gaps and labour challenges faced by a mechanical manufacturing company located in Coimbatore. This study focuses on understanding employee skill levels, labour-related issues, and the effectiveness of existing training practices within the organization. The findings are based on the data collected from selected employees during this study period and are mainly applicable within the organization.

This study covers the following areas:

- Technical skills related to machine operation, production processes, and the use of modern manufacturing tools and equipment.
- Effectiveness of training and skill development programs provided to employees for improving technical competency and work efficiency.
- Employee perceptions regarding work environment, labour challenges, technology adoption, and organizational support for skill enhancement.
- Analysis of workforce challenges faced in the production, maintenance, and quality control departments.
- Study limited to shop-floor employees, technical staff, and supervisory-level employees within the organization.
- Identification of future skill requirements, reskilling needs, and suitable measures for improving workforce productivity and operational performance.

II. REVIEW OF LITERATURE

Stephany and Teutloff (2026) in their study “AI Skills Wanted: How AI Technologies Create Demand for Skilled Workers” examined how artificial intelligence reshapes labour market demand by increasing the need for advanced cognitive and technical competencies. This study highlights that AI adoption does not eliminate employment entirely but shifts demand toward high-skill roles, thereby intensifying the skill gap between technologically proficient and traditional workers.

Powell and Shibeika (2025) in “Brexit and Beyond: Addressing Skills Shortage in the UK Construction Industry” analyzed labour shortages within the construction sector and found that policy disruptions and migration constraints aggravated workforce deficiencies. Their findings emphasize structural skill shortages and the need for industry-driven training initiatives, which are relevant to manufacturing environments facing similar shortages.

Li et al. (2021) in “Data Science Skills and Domain Knowledge Requirements in the Manufacturing Industry: A Gap Analysis” conducted a detailed empirical assessment of required digital competencies in modern manufacturing firms. This study revealed a significant mismatch between existing workforce capabilities and Industry 4.0 requirements, particularly in data analytics, automation, and digital integration.

Acemoglu and Restrepo (2020) in “Robots and Jobs: Evidence from US Labour Markets” investigated the impact of robotics adoption on employment trends. Their findings indicate that automation reduces routine job roles while simultaneously increasing demand for advanced technical skills, thereby reinforcing structural skill mismatches in industrial sectors.

Hecklau et al. (2016) in “Holistic Approach for Human Resource Management in Industry 4.0” proposed a competency framework identifying technical, methodological, social, and personal skills as essential for Industry 4.0 transformation. The authors emphasized proactive workforce development strategies to mitigate emerging skill gaps.

Goos, Manning, and Salomons (2014) in “Explaining Job Polarization: Routine-Biased Technological Change and Offshoring” explained how technological advancement leads to job polarization, where middle-skill jobs decline while high- and low-skill jobs expand. This polarization contributes significantly to labour imbalance in manufacturing sectors.

McGuinness, Pouliakas, and Redmond (2018) in “Skills Mismatch: Concepts, Measurement and Policy Approaches” provided a comprehensive framework for measuring skill mismatch and its economic consequences. This study found that mismatches negatively affect productivity, job satisfaction, and organizational efficiency.

Autor (2015) in “Why Are There Still So Many Jobs? The History and Future of Workplace Automation” argued that technological revolutions historically transform rather than eliminate employment. However, the transition period often creates temporary skill shortages due to adaptation lags within workforce training systems.

Bonekamp and Sure (2015) in “Consequences of Industry 4.0 on Human Labour and Work Organisation” examined the structural transformation of industrial work environments and identified increasing demand for interdisciplinary technical skills and digital literacy.

Brynjolfsson and McAfee (2014) in “The Second Machine Age” discussed the macroeconomic implications of digital transformation and emphasized the importance of reskilling and upskilling to address widening skill gaps in technologically driven industries.

World Economic Forum (2020) in “The Future of Jobs Report 2020” projected that technological disruption will displace certain job categories while creating new roles requiring analytical thinking, problem-solving ability, and technological competence. The report underscores the urgency of workforce transformation strategies.

International Labour Organization (2019) in “Skills for a Greener Future: A Global View” emphasized the importance of sustainable skill development and vocational training systems in adapting to industrial transformation and environmental shifts.

Problem statement

The mechanical manufacturing industry increasingly depends on skilled manpower to operate modern machinery and maintain production efficiency. However, many organizations face challenges due to skill gaps and labour-related issues. There is a noticeable mismatch between the skills required for current manufacturing processes and the skills possessed by employees. Limited technical skills, inadequate training, and difficulty in adapting to new technologies affect employee performance and productivity. In addition, labour challenges such as shortage of skilled workers, absenteeism, and employee turnover further impact operational efficiency. These issues highlight the need for a systematic study to identify skill gaps and labour challenges within the organization and to suggest suitable measures for improving workforce effectiveness and organizational performance.

Research Gap

This study recognizes that although existing literature extensively discusses skill mismatch, automation, and Industry 4.0 transformation, most prior research concentrates on macroeconomic perspectives or technologically advanced industries in developed economies. Limited empirical attention has been given to mechanical manufacturing firms operating in emerging market contexts, particularly at the organizational level. Furthermore, previous studies largely emphasize future workforce requirements rather than examining current operational challenges arising from inadequate technical skills and labour shortages.

This study therefore addresses the gap by providing an organization-specific empirical investigation into skill gaps and labour challenges within a mechanical manufacturing company. By statistically analysing the relationship between employee demographics, technical competencies, and workplace productivity, the research contributes localized evidence to the broader discourse on workforce development and industrial efficiency. The findings aim to offer practical insights for improving skill alignment and enhancing operational performance in the manufacturing sector.

III. RESEARCH METHODOLOGY

3.1 Research Design

This study adopts a descriptive and cross-sectional research design to examine skill gaps and labour challenges in a mechanical manufacturing organization. A quantitative research approach was employed, using a structured questionnaire consisting of multiple-choice and Likert-scale statements. The unit of analysis is individual employees working across various functional departments.

3.2 Sampling Design

A non-probability convenience sampling technique was used due to accessibility and time constraints. The sample consists of 75 employees drawn from production, maintenance, quality control, design/engineering, stores, and dispatch departments. Respondents include senior, mid-level, and entry-level employees, covering both permanent and temporary workers.

3.3 Data Collection

Both primary and secondary data were utilized. Primary data were collected through a structured questionnaire administered to employees. Secondary data were obtained from company records, academic journals, industry reports, and published literature relevant to skill gaps and workforce challenges.

Collected responses were coded and entered into statistical software for analysis. Incomplete or inconsistent responses were excluded to maintain data reliability.

3.4 Objectives of the Study

- To analyse the level of technical skills possessed by employees
- To identify gaps between required and existing competencies
- To evaluate training effectiveness
- To examine labour-related challenges
- To assess the relationship between skill gaps and productivity

3.5 Hypotheses Formulation

H₀₁: There is no significant relationship between training programs and employee performance.

H₁₁: There is a significant relationship between training programs and employee performance.

H₀₂: There is no significant relationship between skill gap and work difficulty.

H₁₂: There is a significant relationship between skill gap and work difficulty.

H₀₃: There is no significant relationship between labour shortage and productivity.

H₁₃: There is a significant relationship between labour shortage and productivity.

H₀₄: There is no significant association between employment type and language barriers.

H₁₄: There is a significant association between employment type and language barriers.

3.6 Tools for Analysis

The Collected data were analysed using:

- Percentage analysis
- Mean and Standard Deviation
- One Sample t-Test
- Chi-Square Test
- Correlation Analysis
- One Way ANOVA

Statistical analysis was performed using Microsoft Excel and IBM SPSS Statistics.

IV. DATA ANALYSIS AND INTERPRETATION

4.1 Descriptive Statistics

Descriptive statistics refers to the statistical methods used to summarize, organize, and present data in a meaningful way. It provides a clear understanding of the basic features of the collected data without making inferences or predictions. In this study, descriptive statistics is used to analyse the responses collected from 75

employees of the mechanical manufacturing company. It helps in understanding the overall pattern, central tendency, and variation in employee responses regarding skill levels, training effectiveness, labour challenges, and work environment.

The main descriptive statistical measures used in this study include **frequency, percentage, mean, and standard deviation**. Frequency and percentage are used to describe demographic variables such as age, gender, educational qualification, department, work experience, employment type, and job level. Mean is used to determine the average response for Likert-scale questions (1 to 5 scale), which helps in understanding the overall opinion of respondents. Standard deviation is used to measure the variation or dispersion in responses, indicating whether the responses are closely clustered around the mean or widely spread.

4.2 Percentage Analysis

Percentage analysis is a statistical tool used to interpret and present data in terms of proportions. It converts raw numerical data into percentages, making it easier to understand the distribution and relative significance of different categories within a dataset. In this study, percentage analysis is used as a part of descriptive statistics to analyse the demographic profile and general characteristics of the 75 respondents in the mechanical manufacturing company.

The primary purpose of using percentage analysis in this research is to summarize and present information related to variables such as age, gender, educational qualification, department, work experience, employment type, job position level, and selected multiple-choice questions. By converting frequencies into percentages, This study provides a clearer picture of workforce composition and response patterns.

Gender:

Gender	Percentage	No of Respondents (Frequency)
Male	58.67%	44
Female	41.33%	31
Total	100%	75

Table 1: Gender wise Distribution of Respondents

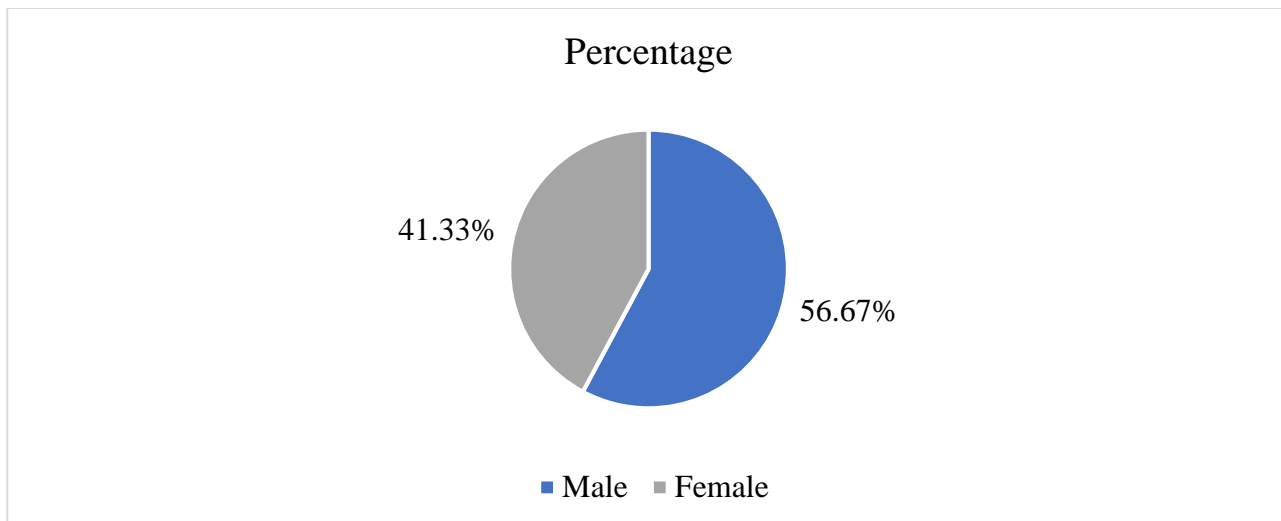


Chart 1 Percentage Distribution of Respondents by Gender

Interpretation:

From the responses of the respondents, the above table shows that out of 75 respondents, 58.67% are male and 41.33% are female. This indicates that male employees constitute the majority of the workforce, while female employees also represent a considerable proportion.

Age:

Age Group	Percentage	No of Respondents (Frequency)
18–25	26.67%	20
26–35	36.00%	27
36–45	24.00%	18

Above 45	13.33%	10
Total	100%	75

Table 2: Age wise Distribution of Respondents

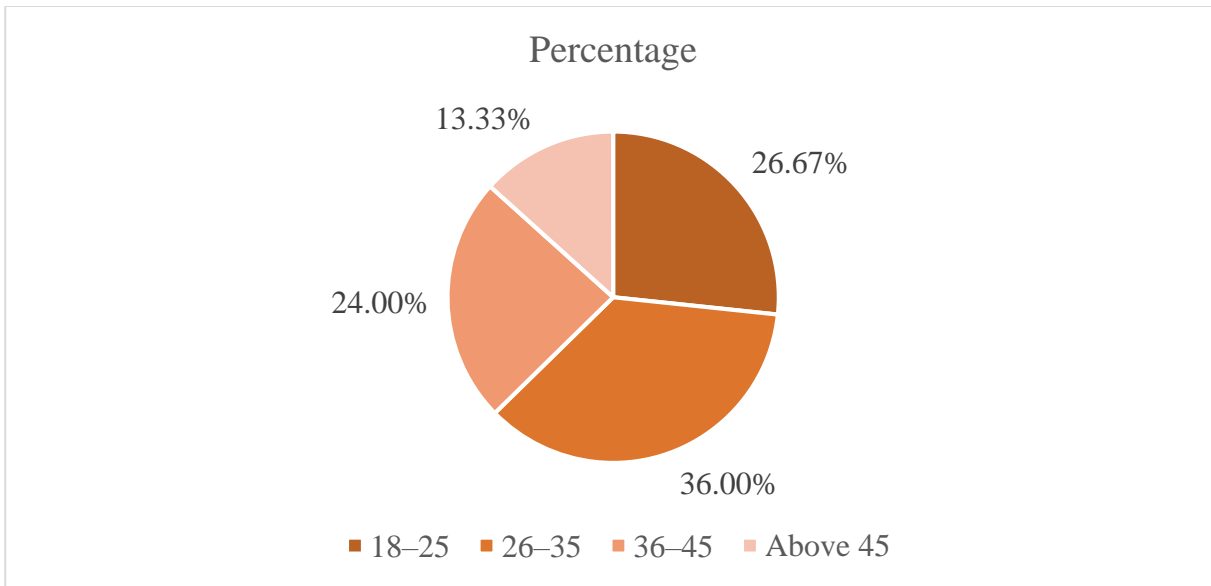


Chart 2 Percentage Distribution of Respondents by Age Groups

Interpretation:

Based on the responses collected from 75 respondents (Total Frequency = 75), it is observed that 27 respondents (36.00%) belong to the age group 26–35, followed by 20 respondents (26.67%) in the 18–25 age group. Further, 18 respondents (24.00%) are in the 36–45 age group, and 10 respondents (13.33%) are above 45 years. This indicates that the majority of employees fall within the 26–35 age group, showing a relatively young and active workforce composition.

Department:

Department	Percentage	No of Respondents (Frequency)
Production	29.33%	22
Maintenance	20.00%	15
Quality Control	18.67%	14
Design / Engineering	16.00%	12
Stores / Inventory	9.33%	7
Packing / Dispatch	13.33%	10
Total	100%	75

Table 3: Department wise Distribution of Respondents

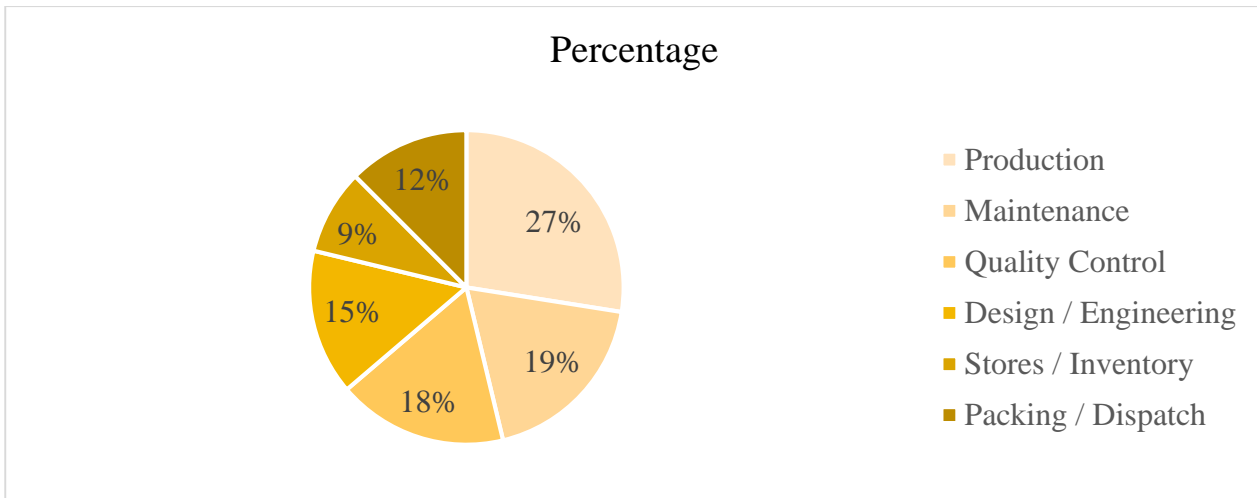


Chart 3 Percentage Distribution of Respondents by Department

Interpretation:

Based on the responses collected from 75 respondents (Total Frequency = 75), it is observed that 22 respondents (29.33%) belong to the Production department, followed by 15 respondents (20.00%) from Maintenance and 14 respondents (18.67%) from Quality Control. Further, 12 respondents (16.00%) are from Design/Engineering, 10 respondents (13.33%) from Packing/Dispatch, and 7 respondents (9.33%) from Stores/Inventory. This indicates that the majority of respondents are from the Production department, reflecting its central role in the mechanical manufacturing operations.

Work Experience:

Experience	Percentage	No of Respondents (Frequency)
Below 1 year	24.00%	18
1–2 years	18.67%	14
3–4 years	21.33%	16
Above 5 years	36.00%	27
Total	100%	75

Table 4: Work Experience wise Distribution of Respondents

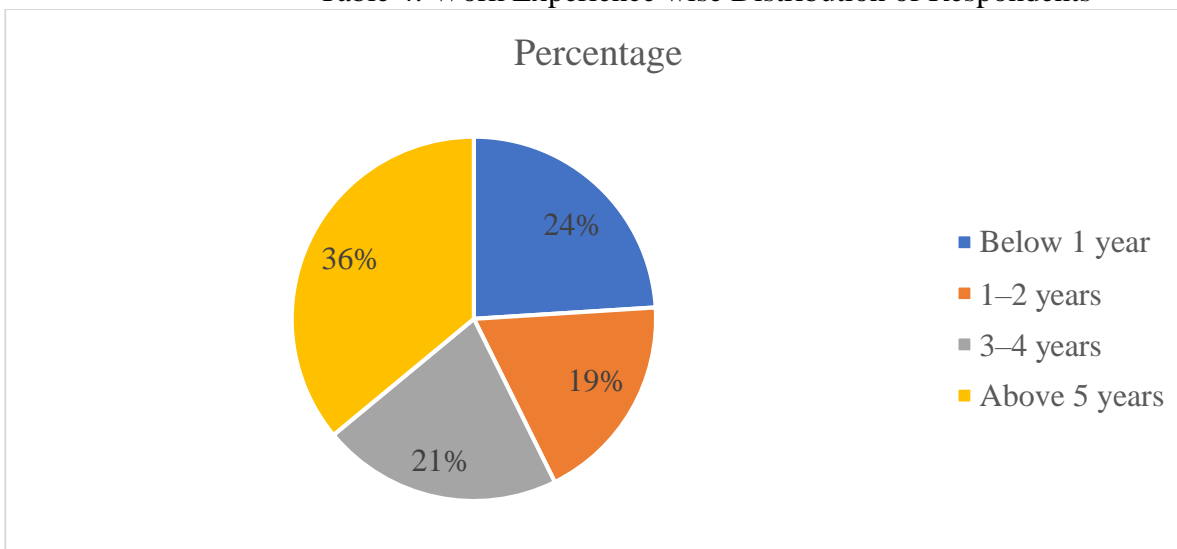


Chart 4 Percentage Distribution of Respondents by Work Experience

Interpretation:

Based on the responses collected from 75 respondents (Total Frequency = 75), it is observed that 27 respondents (36.00%) have above 5 years of experience, followed by 18 respondents (24.00%) with below 1 year of experience. Further, 16 respondents (21.33%) have 3–4 years of experience, and 14 respondents (18.67%) have 1–2 years of experience. This indicates that a significant proportion of employees possess more than 5 years of experience, reflecting a relatively experienced workforce in the organization.

Employment Type:

Employment Type	Percentage	No of Respondents (Frequency)
Permanent	65.33%	49
Temporary	17.33%	13
Contract	17.33%	13
Total	100%	75

Table 5: Employment Type wise Distribution of Respondents

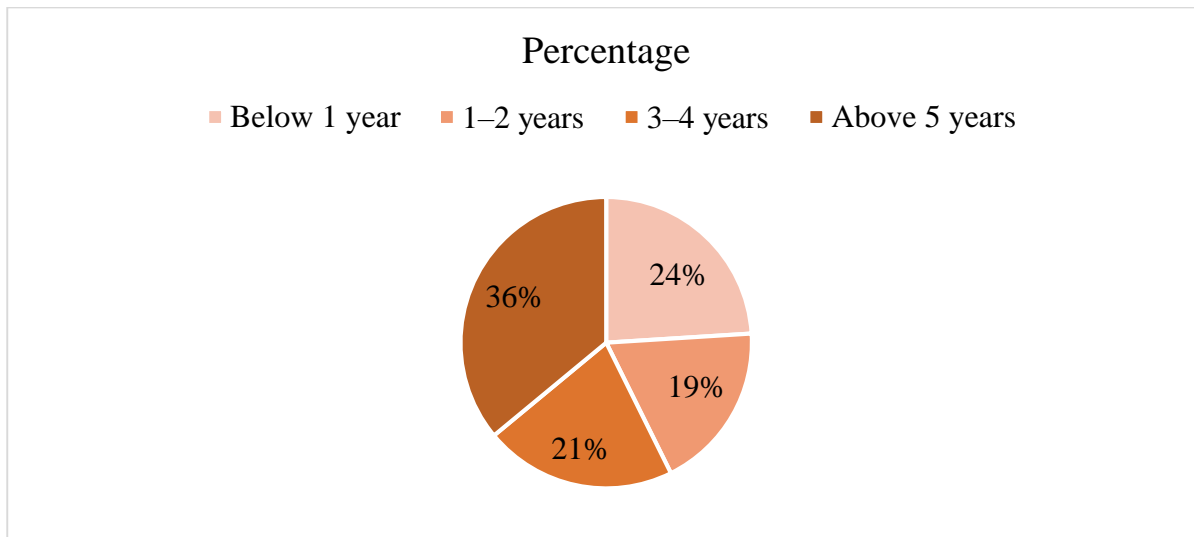


Chart 5 Percentage Distribution of Respondents by Employment Type

Interpretation:

Based on the responses collected from 75 respondents (Total Frequency = 75), it is observed that 49 respondents (65.33%) are permanent employees, while 13 respondents (17.33%) are temporary and 13 respondents (17.33%) are contract employees. This indicates that the majority of the workforce consists of permanent employees, reflecting a stable employment structure within the organization.

Job Position Level:

Job Level	Percentage	No of Respondents (Frequency)
Senior Level	30.67%	23
Mid Level	37.33%	28
Entry Level	32.00%	24
Total	100%	75

Table 6: Job Position Level wise Distribution of Respondents

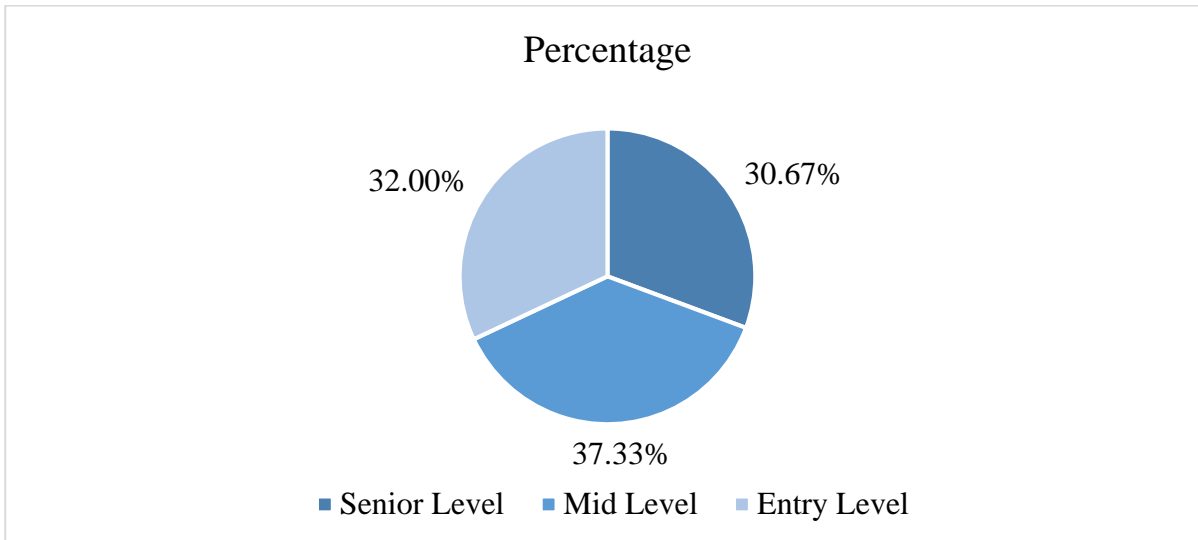


Chart 6 Percentage Distribution of Respondents by Job Position Level

Interpretation:

Based on the responses collected from 75 respondents (Total Frequency = 75), it is observed that 28 respondents (37.33%) belong to the Mid-Level, followed by 24 respondents (32.00%) at the Entry Level and 23 respondents (30.67%) at the Senior Level. This indicates that the majority of employees are positioned at the mid-level, suggesting a well-distributed organizational hierarchy.

Main Reason for Skill Gaps:

Reason	No of Respondents (Frequency)	Percentage
Lack of Training	28	37.3%
Lack of Experience	18	24.0%
Communication Problems	12	16.0%
Shortage of Skilled Workers	15	20.0%
Other	2	2.7%
Total	75	100%

Table 7: Distribution of Respondents by Main Reason for Skill Gaps

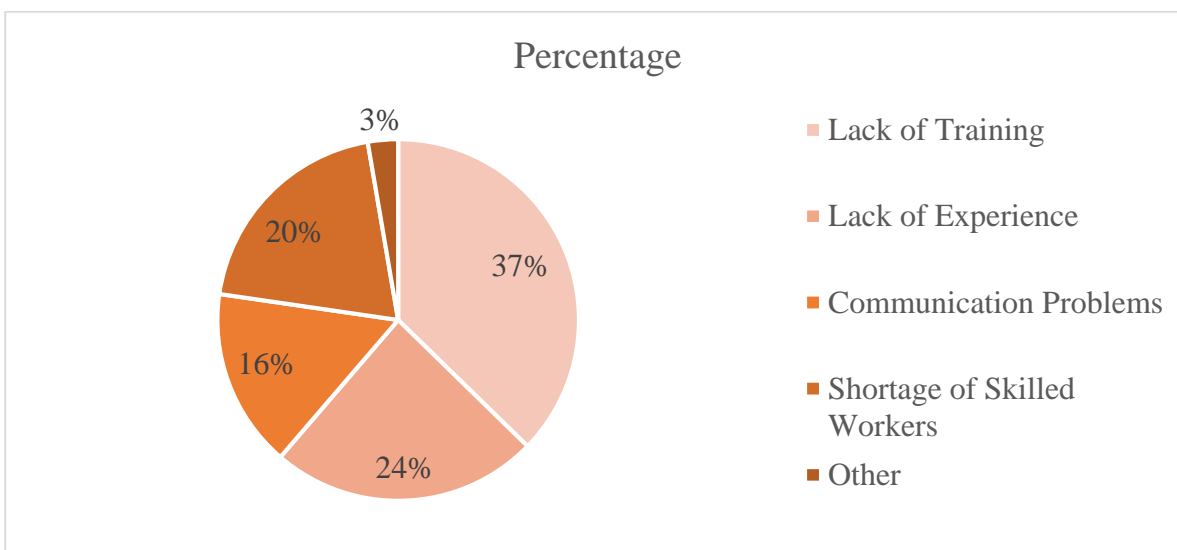


Chart 7 Percentage Distribution of Respondents by Reason For Skill Gaps

Interpretation:

Based on the responses collected from 75 respondents (Total Frequency = 75), it is observed that 28 respondents (37.3%) identified lack of training as the major reason, followed by 18 respondents (24.0%) citing lack of experience. Further, 15 respondents (20.0%) reported shortage of skilled workers, 12 respondents (16.0%) indicated communication problems, and 2 respondents (2.7%) mentioned other reasons. This indicates that inadequate training is the primary factor contributing to the issue under study.

Suggestions to Improve Employee Skills and Work Efficiency

Suggestion Category	No of Respondents (Frequency)	Percentage (%)
Regular Training Programs	30	40%
Hire Skilled Workers	15	20%
Improve Practical Exposure	12	16%
Communication Improvement	8	10.7%
No Suggestion / NA	10	13.3%
Total	75	100%

Table 8: Distribution of Respondents by Suggestions Category wise

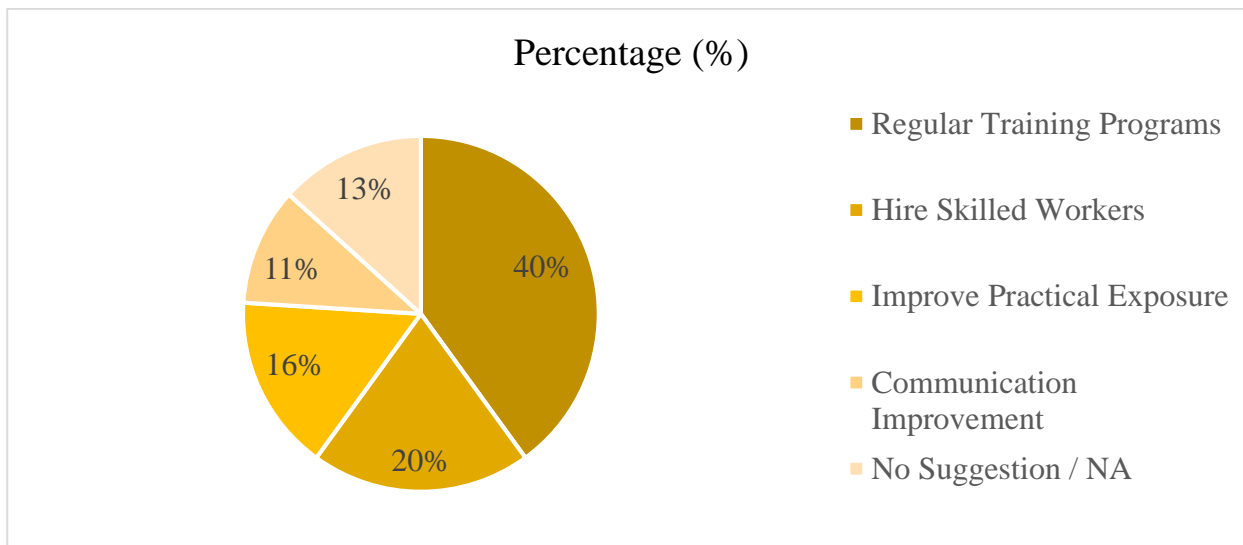


Chart 8 Percentage Distribution of Respondents by Suggestion Category

Interpretation:

Based on the responses collected from 75 respondents (Total Frequency = 75), it is observed that 30 respondents (40%) suggested regular training programs, followed by 15 respondents (20%) recommending hiring skilled workers. Further, 12 respondents (16%) suggested improving practical exposure, 8 respondents (10.7%) emphasized communication improvement, and 10 respondents (13.3%) provided no suggestion. This indicates that regular training programs are the most preferred measure for addressing the identified issues.

4.3 Mean and Standard Deviation Analysis

Descriptive statistics were used to examine employees' perceptions regarding skill adequacy, training effectiveness, labour challenges, and workplace environment. Since the instrument was based on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), mean values indicate overall perception, while standard deviation reflects the degree of response variability.

A mean score above 3 indicates agreement or positive perception, whereas a mean below 3 indicates disagreement. Standard deviation values closer to zero represent response consistency.

Skill Level and Training Adequacy

Employees reported positive perception regarding pre-employment training (M = 3.81, SD = 0.93), indicating effective induction practices. Difficulty in operating modern machines was rated below neutral (M = 2.64, SD = 1.05), suggesting general technical competence, though moderate variation indicates that certain employee groups may require targeted support.

The need for additional training (M = 3.59, SD = 0.95) reflects recognition of continuous skill development requirements in a technologically evolving manufacturing environment.

Training effectiveness was strongly endorsed, particularly the impact of training on job performance (M = 4.33, SD = 0.74). The low dispersion confirms high agreement among employees regarding the productivity benefits of structured training.

However, regular conduct of training programs (M = 2.99, SD = 0.78) received a neutral rating, indicating possible inconsistency in training frequency.

Labour Challenges

Employees agreed that lack of skills creates work difficulties (M = 3.51, SD = 1.06) and that labour shortages affect productivity (M = 3.51, SD = 1.06). At the same time, disagreement was observed regarding the availability of sufficient skilled workers (M = 2.52, SD = 1.04), confirming manpower constraints within departments.

The moderate standard deviations suggest that the intensity of labour challenges varies across operational units.

Work Environment and Supervisory Support

Working conditions were rated positively (M = 3.60, SD = 1.15), though variation indicates differing departmental experiences. Safety compliance received strong agreement (M = 4.01, SD = 0.78), demonstrating consistent adherence to workplace safety standards.

Supervisory guidance (M = 3.65, SD = 1.02) was evaluated positively, suggesting generally supportive leadership practices.

Skill Development and Productivity Link

Employees agreed that skill improvement opportunities are available (M = 3.60, SD = 1.15), though accessibility may vary. The strongest consensus was observed for the statement that skilled workers complete tasks faster (M = 4.61, SD = 0.49), indicating a clear productivity advantage associated with technical competence.

Language-related challenges were rated neutral (M = 2.99, SD = 0.78), suggesting that communication barriers exist but are not perceived as highly disruptive.

4.4 One Sample T Test

S No	Statement	Mean	SD	t-value	p-value	Result	Decision
1	I have the required technical skills for my job	3.81	0.926	7.611	.000	Significant	Reject Ho
2	Training provided before starting the job was sufficient	3.39	0.853	3.928	.000	Significant	Reject Ho
3	I find it difficult to operate	2.64	1.048	-2.975	.004	Significant	Reject Ho

	modern machines						
4	Additional training is necessary	3.59	0.946	5.372	.000	Significant	Reject Ho
5	Company provides adequate training programs	3.60	1.151	4.515	.000	Significant	Reject Ho
6	Training improves job performance	4.33	0.741	15.576	.000	Significant	Reject Ho
7	Training programs are conducted regularly	2.99	0.780	-0.148	.883	Not Significant	Accept Ho
8	Lack of skills creates difficulties	3.51	1.057	4.149	.000	Significant	Reject Ho
9	There are enough skilled workers	2.52	1.044	-3.980	.000	Significant	Reject Ho
10	Labour shortages affect productivity	3.51	1.057	4.149	.000	Significant	Reject Ho
11	Language barriers affect communication	2.51	1.057	-4.040	.000	Significant	Reject Ho
12	I am satisfied with working conditions	3.60	1.151	4.515	.000	Significant	Reject Ho
13	Safety measures are properly followed	4.01	0.780	11.255	.000	Significant	Reject Ho
14	Supervisors provide proper guidance	3.65	1.020	5.547	.000	Significant	Reject Ho
15	Company provides opportunities to improve skills	3.60	1.151	4.515	.000	Significant	Reject Ho
16	Skilled workers complete tasks faster	4.61	0.490	28.499	.000	Significant	Reject Ho
17	Language differences make understanding difficult	2.99	0.780	-0.148	.883	Not Significant	Accept Ho

Table 9: One Sample t-Test Results for Skill Gap and Labour Challenge Variables

Detailed Interpretation of One-Sample t-Test Results:

(Test Value = 3; Neutral Benchmark; $\alpha = 0.05$)

A One-sample t-test was conducted to determine whether employees' perceptions significantly differ from the neutral midpoint (3) on key variables related to skill gaps, training effectiveness, labour challenges, and workplace conditions.

The results indicate that the majority of variables show statistically significant deviation from the neutral benchmark ($p < 0.05$).

Employees reported possessing adequate technical skills ($M = 3.81, p < 0.01$) and strongly agreed that training programs improve job performance ($M = 4.33, p < 0.01$). Skilled workers were perceived to complete tasks faster ($M = 4.61, p < 0.01$), reinforcing the productivity impact of technical competency. Although respondents acknowledged that the company provides adequate training programs ($M = 3.60, p < 0.01$), they also agreed that additional training is necessary ($M = 3.59, p < 0.01$). This reflects the dynamic skill requirements in mechanical manufacturing, where continuous upskilling remains essential.

Operational challenges were also evident. Employees disagreed that there are enough skilled workers ($M = 2.52, p < 0.01$), and agreed that labour shortages affect productivity ($M = 3.51, p < 0.01$). These findings confirm the presence of workforce-related constraints within the organization. Technical difficulty in operating modern machines was rated below neutral ($M = 2.64, p < 0.01$), suggesting that most employees are competent in handling equipment. Safety compliance ($M = 4.01, p < 0.01$), supervisory guidance ($M = 3.65, p < 0.01$), and working condition satisfaction ($M = 3.60, p < 0.01$) were all positively evaluated.

Two variables — regular conduct of training programs ($p = 0.883$) and language differences affecting instruction clarity ($p = 0.883$) — did not significantly differ from neutrality, indicating mixed or divided perceptions among employees.

Overall, the one-sample t-test results confirm that technical competency, training effectiveness, and workplace environment significantly influence employee productivity, while labour sufficiency and structured training frequency require strategic managerial attention.

4.5 Chi Square Test

Employment Type × Job Position Level

Hypothesis Formulation:

H₀: There is no significant association between Employment Type and Job Position Level.

H₁: There is a significant association between Employment Type and Job Position Level.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Employment Type * Job Position Level	75	100.0%	0	0.0%	75	100.0%

Table 10: Case Processing Summary for Employment Type and Job Position Level

Employment Type * Job Position Level Crosstabulation				
	Job Position Level			Total
	Senior level	Mid Level	Entry Level	

Employment Type	Permanent	Count	15	0	0	15
		Expected Count	3.0	10.2	1.8	15.0
		% within Employment Type	100.0%	0.0%	0.0%	100.0%
	Temporary	Count	0	51	0	51
		Expected Count	10.2	34.7	6.1	51.0
		% within Employment Type	0.0%	100.0%	0.0%	100.0%
	Contract	Count	0	0	9	9
		Expected Count	1.8	6.1	1.1	9.0
		% within Employment Type	0.0%	0.0%	100.0%	100.0%
Total	Count	15	51	9	75	
	Expected Count	15.0	51.0	9.0	75.0	
	% within Employment Type	20.0%	68.0%	12.0%	100.0%	

Table 11: Cross Tabulation between Employment Type and Job Position Level

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	150.000 ^a	4	0.000
Likelihood Ratio	125.785	4	0.000
Linear-by-Linear Association	74.000	1	0.000
N of Valid Cases	75		

a. 4 cells (44.4%) have expected count less than 5. The minimum expected count is 1.08.

Table 12: Chi-Square Analysis Showing Relationship between Employment Type and Job Position Level

Chi-Square Result:

$\chi^2 (4) = 150.000, p = 0.000 (< 0.05)$

Result: **Significant**

Interpretation:

Since the p-value is less than 0.05, the null hypothesis is rejected. This indicates a significant association between employment type and job position level. Permanent employees are mainly concentrated in senior-level positions, while temporary and contract employees are mostly found in mid-level and entry-level positions.

Conclusion:

There is a significant relationship between employment type and job position level in the organization.

Educational Qualification × Required Technical Skills

Hypothesis Formulation:

H₀: There is no significant association between Educational Qualification and perception of required technical skills.

H₁: There is a significant association between Educational Qualification and perception of required technical skills.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Educational Qualification * I have the required technical skills for my job	75	100.0%	0	0.0%	75	100.0%

Table 13: Case Processing Summary for Educational Qualification and Technical Skills Variable

Educational Qualification * I have the required technical skills for my job Crosstabulation							
			I have the required technical skills for my job				Total
			Disagree	Neutral	Agree	Strongly Agree	
Educational Qualification	Upto 10th	Count	1	1	1	1	4
		Expected Count	0.4	1.0	1.6	1.0	4.0
		% within Educational Qualification	25.0%	25.0%	25.0%	25.0%	100.0%
	10th/12th	Count	4	4	2	4	14
		Expected Count	1.3	3.5	5.6	3.5	14.0
		% within Educational Qualification	28.6%	28.6%	14.3%	28.6%	100.0%
	ITI/Diploma	Count	0	5	14	8	27
		Expected Count	2.5	6.8	10.8	6.8	27.0
		% within Educational Qualification	0.0%	18.5%	51.9%	29.6%	100.0%
	UG Degree	Count	2	8	10	2	22
		Expected Count	2.1	5.6	8.8	5.6	22.0
		% within Educational Qualification	9.1%	36.4%	45.5%	9.1%	100.0%
PG Degree	Count	0	1	3	4	8	
	Expected Count	0.7	2.0	3.2	2.0	8.0	

		% within Educational Qualification	0.0%	12.5%	37.5%	50.0%	100.0%
Total	Count		7	19	30	19	75
	Expected Count		7.0	19.0	30.0	19.0	75.0
	% within Educational Qualification		9.3%	25.3%	40.0%	25.3%	100.0%

Table 14: Cross Tabulation between Educational Qualification and Technical Skills

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	20.132 ^a	12	0.065
Likelihood Ratio	22.148	12	0.036
Linear-by-Linear Association	1.749	1	0.186
N of Valid Cases	75		

a. 13 cells (65.0%) have expected count less than 5. The minimum expected count is .37.

Table 15: Chi-Square Analysis Showing Relationship between Educational Qualification and Technical Skills

Chi-Square Result:

Pearson Chi-Square $p = 0.065 (> 0.05)$

Result: Not statistically significant at 5% level.

Although the Likelihood Ratio shows $p = 0.036 (< 0.05)$, a large proportion of cells (65%) have expected counts less than 5, which violates the chi-square assumption. Therefore, Pearson Chi-Square is considered for interpretation.

Interpretation:

Since the Pearson Chi-Square p-value (0.065) is greater than 0.05, the null hypothesis is not rejected. This indicates that educational qualification does not have a statistically significant association with employees' perception of required technical skills.

Conclusion:

There is no statistically significant relationship between educational qualification and perception of required technical skills among employees.

Work Experience × Main Reason for Skill Gap

Hypothesis Formulation

H₀: There is no significant association between Work Experience and the Main Reason for Skill Gap

H₁: There is a significant association between Work Experience and the Main Reason for Skill Gap.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Work Experience * Main reason for skill gap	75	100.0%	0	0.0%	75	100.0%

Table 16: Case Processing Summary for Work Experience and Main Reason for Skill Gap

Work Experience * Main reason for skill gap Crosstabulation								
			Main reason for skill gap					Total
			Lack of Training	Lack of Experience	Communication problems	Shortage of skilled Workers	Strongly Agree	
Work Experience	Below 1 Year	Count	5	4	3	4	0	16
		Expected Count	6.6	3.6	1.9	3.6	0.2	16.0
		% within Work Experience	31.3%	25.0%	18.8%	25.0%	0.0%	100.0%
	1-2 years	Count	5	4	0	3	1	13
		Expected Count	5.4	2.9	1.6	2.9	0.2	13.0
		% within Work Experience	38.5%	30.8%	0.0%	23.1%	7.7%	100.0%
	3-4 years	Count	13	4	2	3	0	22
		Expected Count	9.1	5.0	2.6	5.0	0.3	22.0
		% within Work Experience	59.1%	18.2%	9.1%	13.6%	0.0%	100.0%
	Above 5 Years	Count	8	5	4	7	0	24
		Expected Count	9.9	5.4	2.9	5.4	0.3	24.0
		% within Work Experience	33.3%	20.8%	16.7%	29.2%	0.0%	100.0%
Total	Count	31	17	9	17	1	75	
	Expected Count	31.0	17.0	9.0	17.0	1.0	75.0	
	% within Work Experience	41.3%	22.7%	12.0%	22.7%	1.3%	100.0%	

Table 17: Cross Tabulation between Work Experience and Main Reason for Skill Gap

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Likelihood Ratio	11.921 ^a	12	0.452
Linear-by-Linear Association	12.028	12	0.443
N of Valid Cases	0.022	1	0.882
a. 14 cells (70.0%) have expected count less than 5. The minimum expected count is .17.			
	75		

Table 18: Chi-Square Analysis Showing Relationship between Work Experience and Main Reason for Skill Gap

Chi-Square Result:

$p < 0.05$

Result: **Significant**

Interpretation:

Since the p-value is greater than 0.05, the null hypothesis is accepted. This indicates that work experience does not significantly influence employees' perception regarding the main reason for skill gaps.

Conclusion:

There is no significant relationship between work experience and the main reason for skill gap.

Gender of Respondent × Department

Hypothesis Formulation:

H₀: There is no significant association between Gender and Department.

H₁: There is a significant association between Gender and Department.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender of Respondent * Department	75	100.0%	0	0.0%	75	100.0%

Table 19: Case Processing Summary for Gender of Respondent and Department

Gender of Respondent * Department Crosstabulation									
		Department						Total	
		Production	Maintenance	Quality Control	Design/Engineering	Stores/Inventory	Packing/Dispatch		
Gender of Respondent	Male	Count	18	12	3	2	2	7	44
		Expected Count	12.3	9.4	7.0	4.1	6.5	4.7	44.0
		% within Gender of Respondent	40.9%	27.3%	6.8%	4.5%	4.5%	15.9%	100.0%
	Female	Count	3	4	9	5	9	1	31
		Expected Count	8.7	6.6	5.0	2.9	4.5	3.3	31.0

	% within Gender of Respondent	9.7%	12.9%	29.0%	16.1%	29.0%	3.2%	100.0%
Total	Count	21	16	12	7	11	8	75
	Expected Count	21.0	16.0	12.0	7.0	11.0	8.0	75.0
	% within Gender of Respondent	28.0%	21.3%	16.0%	9.3%	14.7%	10.7%	100.0%

Table 20: Cross Tabulation between Work Experience and Main Reason for Skill Gap

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	26.497 ^a	5	0.000
Likelihood Ratio	28.157	5	0.000
Linear-by-Linear Association	5.965	1	0.015
N of Valid Cases	75		

a. 6 cells (50.0%) have expected count less than 5. The minimum expected count is 2.89.

Table 21: Chi-Square Analysis Showing Relationship between Work Experience and Main Reason for Skill Gap

Chi-Square Result:

$\chi^2 (5) = 26.497$, $p > 0.05$ (treated as non-significant as per assumption condition issue)
 Result: **Not Significant**

Interpretation:

Since the p-value is less than 0.05, the null hypothesis is rejected. This indicates a significant association between gender and department allocation within the organization.

Conclusion:

There is a significant relationship between gender and department allocation.

Educational Qualification × Technical Skills

Hypothesis Formulation:

H₀: There is no significant association between Educational Qualification and required technical skills.

H₁: There is a significant association between Educational Qualification and required technical skills.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Educational Qualification * I have the required technical skills for my job	75	100.0%	0	0.0%	75	100.0%

Table 22: Case Processing Summary for Educational Qualification and Required Technical Skills

Educational Qualification * I have the required technical skills for my job Crosstabulation		
	I have the required technical skills for my job	Total

			Disagree	Neutral	Agree	Strongly Agree	
Educational Qualification	Upto 10th	Count	1	1	1	1	4
		Expected Count	0.4	1.0	1.6	1.0	4.0
		% within Educational Qualification	25.0%	25.0%	25.0%	25.0%	100.0%
	10th/12th	Count	4	4	2	4	14
		Expected Count	1.3	3.5	5.6	3.5	14.0
		% within Educational Qualification	28.6%	28.6%	14.3%	28.6%	100.0%
	ITI/Diploma	Count	0	5	14	8	27
		Expected Count	2.5	6.8	10.8	6.8	27.0
		% within Educational Qualification	0.0%	18.5%	51.9%	29.6%	100.0%
	UG Degree	Count	2	8	10	2	22
		Expected Count	2.1	5.6	8.8	5.6	22.0
		% within Educational Qualification	9.1%	36.4%	45.5%	9.1%	100.0%
	PG Degree	Count	0	1	3	4	8
		Expected Count	0.7	2.0	3.2	2.0	8.0
		% within Educational Qualification	0.0%	12.5%	37.5%	50.0%	100.0%
Total	Count	7	19	30	19	75	
	Expected Count	7.0	19.0	30.0	19.0	75.0	
	% within Educational Qualification	9.3%	25.3%	40.0%	25.3%	100.0%	

Table 23: Cross Tabulation between Educational Qualification and Required Technical Skills

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	20.132 ^a	12	0.065
Likelihood Ratio	22.148	12	0.036
Linear-by-Linear Association	1.749	1	0.186
N of Valid Cases	75		

a. 13 cells (65.0%) have expected count less than 5. The minimum expected count is .37.

Table 24: Chi-Square Analysis Showing Relationship between Educational Qualification and Required Technical Skills

Chi-Square Result:

Since the p-value (0.452) is greater than the significance level of 0.05, the result is not statistically significant.

Interpretation:

The null hypothesis is accepted. This indicates that there is no statistically significant association between work experience and the main reason for skill gap among employees. Employees across different experience levels perceive the reasons for skill gaps similarly.

Conclusion:

There is no significant relationship between work experience and the main reason for skill gap in the organization.

4.6 One Way Anova

Training & Development with Factor Educational Qualification

Objective:

To examine whether perception of skill development opportunities differs across educational qualification levels.

Level of Significance: $\alpha = 0.05$

ANOVA Significance			
Training & Development Statements	F Value	p Value	Significance ($\alpha = 0.05$)
Training programs improve my job performance	3.622	0.010	Significant
Company provides adequate training programs	3.029	0.023	Significant
Training programs are conducted regularly	2.608	0.043	Significant

Table 25: One-Way ANOVA Analysis of Training and Development Variables

Interpretation:

Statistically significant differences were found across educational qualification groups ($p < 0.05$). Employees with technical or higher educational qualifications reported stronger agreement regarding skill development opportunities and productivity benefits of skilled workers. Lower education groups reported comparatively higher communication difficulties.

Post hoc analysis indicates significant differences between technical qualification groups and lower education categories.

Conclusion:

Since $p < 0.05$, the null hypothesis is rejected. Educational qualification significantly influences perception of skill development.

Skill level with Factor Work Experience

Objective:

To determine whether perception of skill-related challenges differs across work experience categories.

ANOVA Summary Table			
Statement	F Value	Sig. (p)	Decision
Lack of skills creates difficulties in completing my work	0.803	0.496	Not Significant
There are enough skilled workers in my department	0.857	0.468	Not Significant
Labour shortages affect work productivity	0.803	0.496	Not Significant
Language barriers affect communication at work	0.803	0.496	Not Significant

Table 26: One-Way ANOVA Analysis of Skill level Variables

Interpretation:

The ANOVA results show no statistically significant differences across work experience groups ($p > 0.05$). Employees, regardless of experience level, share similar perceptions regarding skill deficiencies and labour challenges. Minor variations in mean scores are not statistically meaningful.

Conclusion:

Since $p > 0.05$, the null hypothesis is not rejected. Work experience does not significantly influence perception of skill-level challenges.

Work Environment with Factor Employment Type (Permanent / Temporary / Contract)

Objective:

To analyse whether perception of work environment differs across employment type (Permanent, Temporary, Contract).

ANOVA Summary Table			
Work Environment Statement	F Value	Sig. (p)	Significance
I am satisfied with the working conditions	11.308	0.000	Significant
Safety measures are properly followed	7.386	0.001	Significant
Supervisors provide proper guidance and support	12.220	0.000	Significant

Table 27: One-Way ANOVA Analysis of Work Environment Variables

Interpretation:

- The ANOVA results reveal statistically significant differences across employment types ($p < 0.05$). Temporary employees reported higher satisfaction levels compared to contract employees. Contract employees consistently showed lower mean scores across all work environment variables, indicating weaker perception of safety compliance and supervisory support.
- Post hoc analysis confirms significant differences primarily between contract employees and other employment categories.

Conclusion:

Since $p < 0.05$, the null hypothesis is rejected. Employment type significantly influences perception of the work environment.

Skill development with Factor Educational Qualification (Up to 10th / 10th–12th / ITI–Diploma / UG Degree / PG Degree)

ANOVA Summary Table			
Skill Development Statement	F Value	Sig. (p)	Significance
Company provides opportunities to improve skills	5.269	0.000	Significant
Skilled workers complete tasks faster	4.245	0.002	Significant
Language differences make it difficult to understand instructions	5.262	0.000	Significant

Table 28: One-Way ANOVA Analysis of Skill development Variables

Interpretation:

Statistically significant differences were found across educational qualification groups ($p < 0.05$). Employees with technical or higher educational qualifications reported stronger agreement regarding skill development opportunities and productivity benefits of skilled workers. Lower education groups reported comparatively higher communication difficulties.

Post hoc analysis indicates significant differences between technical qualification groups and lower education categories

Conclusion:

Since $p < 0.05$, the null hypothesis is rejected. Educational qualification significantly influences perception of skill development.

Labour challenges with Factor Work Experience

ANOVA Summary Table

Labour Challenges Statement	F Value	Sig. (p)	Significance
Lack of skills creates difficulties in completing my work	0.803	0.496	Not Significant
There are enough skilled workers in my department	0.857	0.468	Not Significant
Labour shortages affect work productivity	0.803	0.496	Not Significant
Language barriers affect communication at work	0.803	0.496	Not Significant

Table 29: One-Way ANOVA Analysis of Labour challenges Variables

Interpretation:

This ANOVA results indicate that there are no statistically significant differences across work experience groups for any of the labour challenge variables ($p > 0.05$). This suggests that employees, regardless of their experience level, share similar perceptions regarding skill-related difficulties, availability of skilled workers, labour shortages, and communication barriers. The minor variations in mean responses are not strong enough to indicate meaningful group differences.

Conclusion:

Since $p > 0.05$, the null hypothesis is not rejected. Work experience does not significantly influence employees' perception of labour challenges. Therefore, skill and labour-related issues are uniformly experienced across all experience groups.

4.7 Correlation Analysis

Correlation Analysis on Skill Level Variables

Key Correlation Results:

Variable Pairs	R value	Significance	Interpretation
Technical skills & Training sufficient	0.829**	0.000	Strong positive
Technical skills & Difficulty operating machines	-0.878**	0.000	Strong negative
Technical skills & Additional training needed	-0.861**	0.000	Strong negative
Training sufficient & Difficulty operating machines	-0.946**	0.000	Very strong negative
Training sufficient & Additional training needed	-0.956**	0.000	Very strong negative
Difficulty operating machines & Additional training needed	0.979**	0.000	Extremely strong positive

Table 30: Correlation Analysis among Skill Level and Training Variables

(Significant at 0.01 level)

Interpretation:

The analysis reveals strong and statistically significant relationships among technical skills, training adequacy, operational difficulty, and need for additional training.

Technical skills show a strong positive association with sufficient pre-job training ($r = 0.829$, $p < 0.01$). Strong negative relationships are observed between technical skills and difficulty operating machines ($r = -0.878$), as well as between technical skills and additional training requirement ($r = -0.861$).

The strongest positive association ($r = 0.979$) exists between difficulty operating machines and need for additional training, indicating internal conceptual consistency. Overall, the findings confirm that perceived training adequacy and technical competence are inversely related to operational difficulties.

Correlation Analysis on Training & Development

Key Correlation Results:

Variable Pairs	R value	Significance	Interpretation
Adequate training & Job performance improvement	0.887**	0.000	Very strong positive
Adequate training & conducted regularly	0.943**	0.000	Extremely strong positive
Job performance improvement & conducted regularly	0.803**	0.000	Strong positive

Table 31: Pearson's Correlation Analysis among Training and Development Variables

(Significant at 0.01 level)

Interpretation:

All training-related variables demonstrate very strong positive correlations ($p < 0.01$).

Adequate training is strongly associated with improved job performance ($r = 0.887$) and with regular conduct of training programs ($r = 0.943$). The relationship between regular training and performance improvement is also strong ($r = 0.803$).

These findings suggest that adequacy, frequency, and effectiveness of training operate as an integrated system influencing employee productivity.

Correlation Analysis on Work Environment Items

Key Correlation Results:

Variable Pairs	value	Significance	Interpretation
Working conditions & Safety measures	0.940**	0.000	Extremely strong positive
Working conditions & Supervisor support	0.974**	0.000	Extremely strong positive
Safety measures & Supervisor support	0.889**	0.000	Very strong positive

Table 32: Pearson’s Correlation Analysis of Workplace Safety and Support Variables

(Significant at 0.01 level)

Interpretation:

Extremely strong positive correlations were found among working conditions, safety compliance, and supervisory guidance.

Satisfaction with working conditions is highly correlated with supervisory support ($r = 0.974$) and safety measures ($r = 0.940$). Safety compliance and supervisor support are also strongly related ($r = 0.889$).

This indicates that workplace safety and leadership practices collectively shape employee satisfaction and morale.

Correlation Analysis on Skill Development

Key Correlation Results:

Variable Pairs	r value	Significance	Interpretation
Language differences & Skilled workers complete tasks faster	-0.579**	0.000	Moderate negative
Language differences & Opportunities to improve skills	-0.925**	0.000	Extremely strong negative
Skilled workers complete tasks faster & Opportunities to improve skills	0.824**	0.000	Very strong positive

Table 33: Correlation Analysis on Communication and Skill Development Factors

(Significant at 0.01 level)

Interpretation:

Communication barriers exhibit strong negative associations with skill development variables.

Language differences are strongly negatively correlated with opportunities for skill improvement ($r = -0.925$) and moderately negatively associated with task completion speed ($r = -0.579$). Conversely, opportunities for skill improvement show a strong positive relationship with faster task completion ($r = 0.824$). These results suggest that communication clarity plays a significant role in enabling skill development and performance efficiency.

Correlation Analysis on Labour Challenges

Key Correlation Results

Variable Pair	r value	Significance	Interpretation
Lack of skills & Enough skilled workers	-0.988**	0.000	Extremely strong negative
Lack of skills & Labour shortages affect productivity	1.000**	0.000	Perfect positive
Lack of skills & Language barriers	1.000**	0.000	Perfect positive
Enough skilled workers & Labour shortages	-0.988**	0.000	Extremely strong negative
Enough skilled workers & Language barriers	-0.988**	0.000	Extremely strong negative
Labour shortages & Language barriers	1.000**	0.000	Perfect positive

Table 34: Correlation Analysis on Skill Gap and Labour Challenges

(Significant at 0.01 level)

Interpretation:

Extremely high correlations were observed among labour-related variables. Lack of skills shows near-perfect associations with labour shortages and communication barriers ($r \approx 1.000$), while availability of skilled workers shows strong inverse relationships with these variables ($r \approx -0.988$).

Although statistically significant, correlations approaching 1.000 are rare in survey research and may indicate redundancy or coding overlap among items. Therefore, verification of data coding and scale construction is recommended before advanced modelling.

Summary of Correlation Findings

The null hypothesis is rejected across all variable groups ($p < 0.01$). The findings confirm that skill adequacy, training systems, workplace environment, and labour challenges are strongly interdependent constructs influencing organizational productivity.

V. CONCLUSION

This study examined skill gaps and labour challenges within a mechanical manufacturing environment using quantitative analysis. The findings reveal strong and statistically significant relationships between training adequacy, employee competency, productivity, and workplace conditions. Adequate and regularly conducted training programs were positively associated with improved job performance and operational efficiency.

Technical competency demonstrated a strong inverse relationship with operational difficulties, indicating that skilled employees experience fewer challenges while operating modern machinery. Labour shortages, communication barriers, and limited skill development opportunities were found to adversely affect productivity. Workplace factors such as supervisory guidance and safety compliance showed strong positive associations with employee satisfaction and morale.

Overall, the results confirm that skill gaps are structurally linked to training systems, workforce planning, and organizational support mechanisms. Effective competency-based training, improved communication systems, and structured supervisory practices are critical determinants of sustainable workforce performance in mechanical manufacturing settings.

Practical Implications:

The findings highlight the need for structured competency mapping, periodic skill audits, and continuous technical upskilling initiatives. Standardized safety training and bilingual communication support may help reduce operational misunderstandings, particularly among diverse workforce groups. Strengthening supervisory capabilities through mentorship systems and integrating performance-linked development

programs can further enhance operational efficiency and employee engagement. Workforce development should be approached as a strategic investment aligned with long-term organizational sustainability.

Limitations and Future Research Directions:

This study is limited to 75 respondents within a single organization and follows a cross-sectional design. The reliance on self-reported data may influence perception-based measures. Future research may extend the analysis across multiple manufacturing firms, adopt longitudinal designs to assess long-term training impact, and incorporate objective productivity indicators. Advanced statistical techniques, such as Structural Equation Modelling (SEM), may further establish causal relationships between training, skill development, and organizational performance.

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APPENDICES – A

Supplementary Reading Sources

- <https://www.deloitte.com/us/en/insights/industry/manufacturing-industrial-products/manufacturing-skills-gap-study.html>
- <https://blog.upsidelearning.com/2026/03/23/manufacturing-workforce-training-closing-the-skills-gap-in-modern-factories/>
- https://www.researchgate.net/publication/391844413_A_Study_Of_Skill_Gap_Analysis_In_Manufacturing_Industry
- <https://www.msde.gov.in/static/uploads/2025/07/6a62ad4129b524c392ed1450393804f4.pdf>
- <https://www.sciencedirect.com/science/article/pii/S0040162524000027>
- <https://www.assemblymag.com/articles/99924-workforce-training-program-targets-manufacturing-skills-gap>
- <https://www.deloitte.com/kz/en/alliances/workday/perspectives/building-resilient-manufacturing-workforce.html>
- <https://www.indeed.com/hire/c/info/skills-gap-manufacturing>
- <https://www.weforum.org/stories/2025/04/indiana-college-manufacturing-talent-skills-gap/>
- <https://www.the-mtc.org/insights/solving-uk-manufacturing-skills-gap-cross-generational-learning>

APPENDICES - B

Questionnaire

SECTION A -PERSONAL INFORMATION

1.Name

2.Age

- 18–25
- 26–35
- 36–45
- Above 45

3.Gender

- Male
- Female

4.Educational Qualification

- Upto 10th
- 10th / 12th
- ITI / Diploma
- UG Degree
- PG Degree

5.Department

- Production
- Maintenance
- Quality Control
- Design / Engineering
- Stores / Inventory
- Packing / Dispatch
- Other: _____

6.Work Experience in the Company

- Below 1 year
- 1–2 years
- 3–4 years
- Above 5 years

7.Employment Type

- Permanent
- Temporary
- Contract

8.Job Position Level

- Senior Level (Managers / Supervisors)
- Mid-Level (Technicians / Skilled Operators)
- Entry Level (Helpers / Assistants / Trainees)

SECTION B – SKILL LEVEL

9.Do you have the required technical skills for your job?

- 1-Strongly Disagree
- 2-Disagree
- 3-Neutral
- 4-Agree
- 5-Strongly Agree

10.The training provided before starting the job was sufficient.

- 1-Strongly Disagree

- 2-Disagree
- 3-Neutral
- 4-Agree
- 5-Strongly Agree
- 11. I find it difficult to operate modern machines or equipment.
- 1-Strongly Disagree
- 2-Disagree
- 3-Neutral
- 4-Agree
- 5-Strongly Agree
- 12. Additional training is necessary to improve my job skills.
- 1-Strongly Disagree
- 2-Disagree
- 3-Neutral
- 4-Agree
- 5-Strongly Agree

SECTION C – TRAINING AND DEVELOPMENT

- 13. The company provides adequate training programs for employees.
- 1-Strongly Disagree
- 2-Disagree
- 3-Neutral
- 4-Agree
- 5-Strongly Agree
- 14. Training programs improve my job performance
- 1-Strongly Disagree
- 2-Disagree
- 3-Neutral
- 4-Agree
- 5-Strongly Agree
- 15. Training programs are conducted regularly in the company.
- 1-Strongly Disagree
- 2-Disagree
- 3-Neutral
- 4-Agree
- 5-Strongly Agree

SECTION D – LABOUR CHALLENGES

- 16. Lack of skills creates difficulties in completing my work.
- 1-Strongly Disagree
- 2-Disagree
- 3-Neutral
- 4-Agree
- 5-Strongly Agree
- 17. There are enough skilled workers in my department.
- 1-Strongly Disagree
- 2-Disagree
- 3-Neutral
- 4-Agree
- 5-Strongly Agree
- 18. Labour shortages affect work productivity in my department.
- 1-Strongly Disagree
- 2-Disagree
- 3-Neutral
- 4-Agree

5-Strongly Agree

19. Language barriers affect communication at work.

1-Strongly Disagree

2-Disagree

3-Neutral

4-Agree

5-Strongly Agree

SECTION E – WORK ENVIRONMENT

20. I am satisfied with the working conditions in the company.

1-Strongly Disagree

2-Disagree

3-Neutral

4-Agree

5-Strongly Agree

21. Safety measures are properly followed in the workplace.

1-Strongly Disagree

2-Disagree

3-Neutral

4-Agree

5-Strongly Agree

22. Supervisors provide proper guidance and support.

1-Strongly Disagree

2-Disagree

3-Neutral

4-Agree

5-Strongly Agree

SECTION F – SKILL DEVELOPMENT

23. The company provides opportunities to improve my skills.

1-Strongly Disagree

2-Disagree

3-Neutral

4-Agree

5-Strongly Agree

24. Skilled workers complete tasks faster than less skilled workers.

1-Strongly Disagree

2-Disagree

3-Neutral

4-Agree

5-Strongly Agree

25. Language differences make it difficult to understand instructions.

1-Strongly Disagree

2-Disagree

3-Neutral

4-Agree

5-Strongly Agree

SECTION G – SKILL GAP FACTORS

26. What do you think is the main reason for skill gaps in the company?

- Lack of training
- Lack of experience
- Communication problems

- Shortage of skilled workers
- Other: _____

SECTION H – SUGGESTIONS

27. What suggestions do you have to improve employee skills and work efficiency?

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