Impact of Training and Development on Job Satisfaction: A Comparative Study of Employees in Select Public and Private Sector Companies of Solar Energy Sector of Uttar Pradesh

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***Abstract*—The study examines the impact of training and development on job satisfaction within the solar energy sector in Uttar Pradesh, focusing on a comparison between public and private sector employees. Data were collected from 100 respondents with 50 from each sector being employed in selected companies used solely for sampling purposes. The research does not evaluate individual organizational performance but focuses on sectoral analysis. A combination of statistical tools including correlation, regression analysis, descriptive statistics, and t-tests was used to analyse the data. Findings indicate a strong positive relationship between training and development initiatives and job satisfaction in both sectors. However, public sector employees reported higher and more consistent levels of satisfaction compared to their private sector counterparts.**

The t-test results confirmed that the differences between the two sectors are statistically significant. Based on these findings, the study recommends the implementation of sector-specific training and development programs aimed at improving employee satisfaction and overall performance. Emphasis should be placed on tailored strategies that address the unique challenges and expectations within both public and private organizations in the renewable energy domain.

***Index Terms*—Training and development, Job satisfaction, public sector companies, Private sector companies, Solar energy sector, Uttar Pradesh**

I. INTRODUCTION

In context with sustainable green environment around the globe, solar energy sector has globally become a vital part in protecting the environment contributing towards sustainable development and conservation of renewable energy resources. In recent years, the solar energy sector has emerged as a critical component of India's renewable energy mission wherein solar power has become a focal point of national energy planning contributing towards reducing carbon emissions and increasing country's dependence on sustainable energy solutions. The solar energy sector in India has witnessed rapid growth in recent years, driven by the government's push for renewable energy and the global shift toward sustainable development. Uttar Pradesh (UP), India's most populous state, holds a prominent position in this shift due to its vast geographic, demographic, and economic profile. With large-scale solar parks, rooftop solar initiatives, and public-private partnerships, and vast stretches of land suitable for solar farms, Uttar Pradesh becomes an ideal region for solar energy development making the solar energy sector has become a major source of employment and innovation. Being supported by Government plan and policies towards solar energy sector as well as having immense growth potential, various public and private companies have step up in this sector thereby expanding their business.

However, as the industry continues to expand, the need for a skilled and adaptable workforce has become increasingly critical. Despite the growth potential, the solar energy sector faces challenges regarding availability and capability of human resources which require a technically skilled and safety-conscious workforce, with expertise in areas such as photovoltaic (PV) installation, energy storage, grid connectivity, project management, and compliance with environmental standards. To maintain quality,

efficiency, and safety in such projects, continuous training and development (T&D) initiatives are essential. Through effective training and development programmes, employees feel competent with their job which provides career advancement opportunities as well as increases their intrinsic motivation thereby making them satisfied with their job. Training and development in the solar energy sector is not just about teaching technical skills it's about how that investment in people affects their confidence, motivation, emotional well-being, and long-term commitment to the organization. When employees perceive training as meaningful and career-enhancing, their job satisfaction significantly improves.

As both public sector and private sector companies are involved in solar energy sector of Uttar Pradesh, it becomes essential to to evaluate the impact of training and development on job satisfaction of employees working within the industry with high potential. Being descriptive and comparative study, seeks to examine the impact of training and development on job satisfaction among employees in the solar energy sector in Uttar Pradesh focusing on a sample of employees from selected public and private sector companies to understand sector-level differences in training and development practices and their impact on job satisfaction. The findings are expected to provide practical insights for human resource managers, policy makers, and organizational leaders looking to enhance workforce motivation and performance in this rapidly growing sector.

[A] Problem Statement: The solar energy sector in India has experienced rapid growth, fuelled by government policies, environmental priorities, and technological advancements. Uttar Pradesh, with its high solar potential, has become a key player in this transition. As both public and private sector companies expand solar infrastructure across the state, the demand for a skilled and motivated workforce has risen significantly. In this context, training and development (T&D) have become aspect for employee's regarding their satisfaction at their workplace. Job satisfaction is a vital aspect of workforce management it influences productivity, retention, and overall morale. In general employees who perceive their organization are investing more in their training are more likely to be satisfied, committed, and engaged with their jovb. In contrast, inadequate training can lead to dissatisfaction, skill gaps, and disengagement. While the importance of training is widely acknowledged, its impact on employee job satisfaction, particularly within the solar energy sector, has received limited academic attention. As public and private sector companies are working in solar energy sector of Uttar Pradesh, there may be sectoral difference in their training approaches. Due lack of empirical research comparing sector-level differences in training and development practices and their impact on employee's job satisfaction, this study tries to bridge the gap if any by conducting a sectoral comparative analysis of the same which aims to examine how variations in training practices influence job satisfaction among employees thereby offering practical insights for HR professionals, policy makers, and organizational leaders seeking to build a more motivated and capable workforce in this strategically important sector.

[B] Need of Study: The solar energy sector in India, particularly in states like Uttar Pradesh, is undergoing a rapid transformation. As the state works to meet its renewable energy targets, both public and private sector companies are playing a crucial role in the development and deployment of solar energy projects. However, the success and efficiency of these companies depend not only on technological advancements but also on the capability, satisfaction, and motivation of the workforce operating within the sector. Training and development are essential to build the necessary competencies, ensure safety, and adapt to evolving standards and innovations in every sector. Despite its importance, the actual impact of training on employee job satisfaction remains underexplored, particularly in the context of the solar energy industry in Uttar Pradesh.

As both public and private sector companies are active in the solar domain of Uttar Pradesh, there may be notable differences in how they implement training and development programs. However, no substantial research has yet been conducted to compare these sectoral practices and evaluate how they influence job satisfaction among employees in this field. Therefore, this study is necessary to bridge the research gap by examining the relationship between training and development and job satisfaction among employees working in both public and private sector companies in the solar energy sector of Uttar Pradesh providing valuable insights for HR managers, policymakers, and

organizational leaders to design more effective, sector-specific training strategies, thereby improving employee's job satisfaction, ultimately contributing to the long-term success of the solar energy sector in the state

[C] Objectives of the Study: The study is proposed to have followed objectives:

1. To examine the relationship between training and development and job satisfaction of employees in a solar energy sector of Uttar Pradesh.
2. To compare the impact of training and development on job satisfaction between public and private sector employees in the solar energy sector of Uttar Pradesh.
3. To recommend ways to enhance job satisfaction among public and private sector employees in solar energy sector of Uttar Pradesh through effective Training and Development strategies.

[D] Hypothesis of Study: To achieve the above objectives of the study, following hypothesis have been formulated

1. For Objective 1: Relationship between training and development and job satisfaction of employees in a solar energy sector of Uttar Pradesh.
   - H_{01} (Null Hypothesis): There is no significant relationship between training and development and job satisfaction among employees in solar energy sector of Uttar Pradesh.
   - H_{11} (Alternate Hypothesis): There is a significant relationship between training and development and job satisfaction among employees in solar energy sector of Uttar Pradesh.

2. For Objective 2: To compare the impact of training and development on job satisfaction between public and private sector employees in the solar energy sector of Uttar Pradesh.
   - H_{02} (Null Hypothesis): There is no significant difference in the impact of training and development on job satisfaction between public and private sector employees in the solar energy sector of Uttar Pradesh.
   - H_{12} (Al ternate Hypothesis): There is a significant difference in the impact of training and development on job satisfaction between public and private sector employees in the solar energy sector of Uttar Pradesh

II. LITERATURE REVIEW

Following literature review has been done for the study:

1) . M. N. Zubairi (2018), in the study tried examines the effect of training and development on job satisfaction, skill enhancement and motivation of 150 employees in Mahindra Group, India using correlation and found a strong positive significant relationship between training and development and Job satisfaction level of employees. The study also concluded in general that despite of less training programmes in public sector, employees still reported a boost in job satisfaction when compared with public sector companies.
2) Rimjhim Jha (2020), in the study explored the impact of training and development in the job satisfaction of nurses working in public and private sector hospitals of Gwalior and Chambal Divisions of Madhya Pradesh using t- test and regression analysis and it was found that an effective and efficient training program of nurses in hospitals of both sector has a positive impact on the job satisfaction of nurse employees as well as job satisfaction of nurses in public sector hospitals were found high as compared to the same of privates sector hospitals.
3) Sharma. V (2023), in the paper tries to assess the Impact of Training & Development on Job Satisfaction of employees of private IT Sector in India using descriptive statistics, & correlation analysis, It was found that here was a strong positive correlation between training and development practices and job satisfaction levels of sample IT employees., revealing employees were more satisfied when training was linked to promotions and personal growth, not just technical upskilling.
4) Jahnavi (2019), in her study on sample employees of Amara Raja Batteries Pvt. Ltd., used correlation analysis to examine the relationships between training satisfaction variables and the employee development dimension of job satisfaction.

The study reports "high to moderately significant positive relationships" between the training variables and job satisfaction outcomes. Sample employees strongly believed that training increased their sense of belonging, confidence, and efficiency in work tasks.

5) Md. Atikur Rahaman (2022), in the paper tries to analyse the effect of training and development as well as promotion policies on the job satisfaction of small and medium size firms in Dhaka, Bangladesh. Data was collected from 202 respondents and was analysed using regression analysis. It was found that training programs and promotion policies have a positive and direct impact on the job satisfaction of employees working in SME's business sector of Dhaka.
6) Chaudhary & Bhaskar (2016), in their study tried to examine the relationship between training and development practices and job satisfaction among some higher education teaching faculty members of public and private institutions using correlation and t test analysis and it was found there was a positive and statistically significant relationship between training and development and job satisfaction of faculty members wherein private sector faculty members who had more frequent and structured training programs showed higher satisfaction levels compared to their counterparts in public institutions.
7) Pandey (2020), in the study tries Examine and compare the job satisfaction levels of managers of various fields in the public and private sectors assessed by various factors including training and development using descriptive statistics and t test. It was found that public sector managers had higher overall job satisfaction compared to private sector managers giving an insight that public sector managers perceived T&D as well-integrated, regular, and aligned with career goals. Private sector managers felt less supported in this area, possibly due to higher pressure and less structured programs
8) .Sumangala C (2016), in the research paper tries to assess the level of job satisfaction of employees of the private and public sector bank and find association between Training and development and job satisfaction of selected sample employees using regression model and it was found that there exist association between Training & development and job satisfaction in public sector and private sector bank employees and also training & development has a significant impact on job performance among employees. with private sector bank employees having some better job satisfaction as compared with public sector bank employees
9) Priyanka Singha (2016), in the research paper tries to Assess and compare job satisfaction levels between teachers in public and private schools.in West Bengal as well as investigated associated factors including training and development using descriptive statistics and concluded that Public school teachers reported higher job satisfaction overall, While job satisfaction differences existed, the study found limited professional development (training) in private schools, which may have affected satisfaction dimensions related to skill growth and recognition of private school teachers

III. RESEARCH GAP

As several studies have been undertaken by various scholars regarding examining relationship between training and development (T&D) and job satisfaction of employees in a various industries or sectors in India as well as tried to conduct a comparative analysis between public and private sector organizations within same industry or sector, a noticeable gap still exist regarding the same in the solar energy sector of Uttar Pradesh. Solar energy sector is in emerging stage for Uttar Pradesh where some public sector and private sector companies have step in to grow their business within solar energy sector of Uttar Pradesh thereby employing a huge segment of workers who require proper time to time training and development serving as a tool for their career advancement which influences their job satisfaction.

Therefore, there is a clear need for a comparative study that examines the impact of Training & Development on job satisfaction among employees in both public and private sector companies operating within the solar energy sector of Uttar Pradesh. This research seeks to address that gap by providing evidence-based insights into how sectoral differences in Training & Development practices influence employee satisfaction at the regional level

IV. RESEARCH METHODOLOGY

The research methodology outlines the systematic approach adopted to achieve the objectives of the present study. This study seeks to explore the relationship between training and development (T&D) and job satisfaction among employees in the solar energy sector of Uttar Pradesh, with a comparative focus on select public and private sector companies working within the solar energy sector of Uttar Pradesh. The methodology includes the research design, sampling plan, data collection methods, and statistical tools used for analysis. A structured questionnaire was employed to collect data from selected respondents, and appropriate statistical techniques were applied to test the hypotheses and derive meaningful conclusions.

[a} Research Design: The present study adopts a descriptive and comparative research design. It is descriptive, as it seeks to describe and examine the relationship between training and development practices and job satisfaction. And it is comparative, as it compares these variables across two categories of organizations public and private sector companies operating within the solar energy domain in Uttar Pradesh.

[b] Sampling Plan Since it is not feasible to study the entire population of employees working in both public and private sector companies in the solar energy sector of Uttar Pradesh, the study draws its sample from employees of select companies in both sectors. While these companies form the basis of data collection, the analysis is conducted at the sectoral level (public vs. private) to identify comparative patterns in the impact of training and development on job satisfaction.

1) Sampling Units: Employees of select public and private solar energy sector companies working in solar energy sector of Uttar Pradesh.

2)Sample size: Total of 100 respondents, comprising 50 employees from public sector companies and 50 employees from private sector companies.

3) Sampling technique A combination of purposive sampling, convenience sampling, and snowball sampling has been used to select respondents, ensuring that participants have relevant experience with training and development initiatives in their respective organizations.

4) Selected Companies: For the public sector, data was collected from employees of Bharat Heavy Electricals Limited (BHEL) and Central Electronics Limited (CEL). For the private sector, data was collected from employees of Jakson Solar and Adani Solar.

Important Note

In line with the study title, employees were selected from specific public and private sector companies in the solar energy sector of Uttar Pradesh. However, in order to maintain confidentiality and avoid company-specific evaluations, the analysis is presented on a sectoral basis (public vs. private sector). The company names are provided solely for defining the sampling frame and do not influence the interpretation of results, which reflect overall sectoral trends.

. [c] Data Collection: Primary data was collected using a structured, close-ended questionnaire divided into three parts as

- Part A: Demographic profile (e.g., age, gender, experience, designation, sector)
- Part B: Training and Development [7 items, on 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).]
- Part C: Job Satisfaction (8 items on 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).]

The questionnaire was distributed in both online google forms and printed format ensuring their voluntary participation wherein their confidentiality for their responses were made

[d] Data Analysis : For the purpose of analysis, composite scores for Training and Development (TD) and Job Satisfaction (JS) were calculated by taking the mean scores of all respective questionnaire items for each respondent which was thereafter statistically analysed using Spearman rank correlation , linear regression , descriptive statistics and t test to find out the impact of T& D on job satisfaction of employees working within public and private sector companies of solar energy sector of Uttar Pradesh as well as help to find out sectorial difference if any

V. ANALYSIS & INTERPRETATION

This section presents the interpretation of results derived from statistical analyses conducted to examine the impact of Training and Development on the job

satisfaction of employees working in select public and private sector solar energy companies in Uttar Pradesh. Furthermore, it aims to identify and compare sectoral differences in these variables within the solar energy sector of Uttar Pradesh. The analyses have been carried out using correlation, linear regression, descriptive statistics, and t-tests, in line with the objectives and hypotheses stated earlier in the study. The interpretation undergoes following steps:

{I} Reliability Analysis: Firstly, to start with the analysis the questionnaire of study was divided into two main segments i.e. Training & Development and Job Satisfaction questions for the employees on which Cronbach Alpha score for various questions in each segment is calculated to test the reliability of the questions dataset.

(1) Training and Development: The Cronbach alpha score of various questions regarding training and development were found reliable with Cronbach alpha value .894 as stated under the table:

Table 1a: Cronbach's Alpha Training and Development Scale

Reliability Statistics	
Cronbach's Alpha	N of Items
.894	7

Source: Author calculation using SPSS

(2) Job Satisfaction: The Cronbach alpha score of various questions regarding job satisfaction were found reliable with Cronbach alpha value .960 as stated under the table

Table 1b: Cronbach's Alpha Job Satisfaction Scale

Reliability Statistics	
Cronbach's Alpha	N of Items
.960	8

Source: Author calculation using SPSS

{II} Composite Score Calculation: Secondly, since both the segment questions have good reliability through Cronbach Alpha score which states acceptable internal consistency, composite scores for Training & Development and Job Satisfaction were computed as the mean of their respective item responses for each respondent response for further objective analysis.

{III} Objective Analysis: Lastly, the result of the study was analysed using composite score of Training and Development Score as well as Job Satisfaction score of respondent's objectives wise. The above-mentioned objective is analysed as under:

Objective 1: Relationship between training and development and job satisfaction of employees in solar energy sector of Uttar Pradesh.

H_{01} (Null Hypothesis): There is no significant relationship between training and development and job satisfaction among employees in solar energy sector of Uttar Pradesh.

H_{11} (Alternate Hypothesis): There is a significant relationship between training and development and job satisfaction among employees in solar energy sector of Uttar Pradesh.

Findings: Relation between Training and Development and Job Satisfaction of employees in solar energy sector of Uttar Pradesh was analysed using Training and Development score as well as Job Satisfaction score of all the respondents The following table shows the result of correlation between the variables using Spearman's Rank Correlation analysis.

Table 2: Spearman Rank Correlation between Job Satisfaction Score and Training & Development Score

Correlations				
			Training Development Score	Job Satisfaction Score
Spearman's rho	Training Development Score	Correlation Coefficient	1.000	.848**
		Sig. (2-tailed)	.	.000
		N	100	100
	Job Satisfaction Score	Correlation Coefficient	.848**	1.000
		Sig. (2-tailed)	.000	.
		N	100	100
**. Correlation is significant at the 0.01 level (2-tailed).				

Source: Author calculation using SPSS

Interpretation: The coefficient of correlation (r) among the Training and Development score and Job Satisfaction score of all employee respondent of solar energy sector of Uttar Pradesh is =.848, p=.000 (significant at .01 level), which indicates a very strong positive correlation between Training Development Score and Job Satisfaction Score specifying that employees who rate training and development highly also tend to rate job satisfaction highly, and vice versa. As correlation between Training Development Score and Job Satisfaction Score of employees in solar energy sector of Uttar Pradesh is found strongly positive correlated and was statistically significant ($p < .01$), we reject the Null Hypothesis (H_{01}) and accept Alternate Hypothesis (H_{11}) which indicates that there is a significant relationship between training and development and job satisfaction among employees in solar energy sector of Uttar Pradesh thereby confirming that better training and development practices are strongly associated with higher job satisfaction levels in solar energy sector of Uttar Pradesh.

Objective 2: To compare the impact of training and development on job satisfaction between public and private sector employees in the solar energy sector of Uttar Pradesh.

- H_{02} (Null Hypothesis): There is no significant difference in the impact of training and development on job satisfaction between public and private sector employees in the solar energy sector of Uttar Pradesh.
- H_{12} (Al ternate Hypothesis): There is a significant difference in the impact of training and development on job satisfaction between public and private sector employees in the solar energy sector of Uttar Pradesh.

Findings: To address this objective, the composite scores for Training and Development (TD) and Job Satisfaction (JS) of employees from public and private sector companies in the solar energy sector of Uttar Pradesh were analysed. The analysis was conducted in three steps:
(1) Sector-wise linear regression,
(2) Descriptive statistics, and
(3) Independent samples t-test.

Following tables show the result of the above objective step wise

Step 1: Linear regression analysis: To measure the effect of Training Development Score on Job Satisfaction Score for each sector individually.

Public Sector Regression Output-

The following tables show the result of regression analysis in order to evaluate the impact of training and development on job satisfaction of public sector employees in solar energy sector of Uttar Pradesh

Table 3a: Model Summary of Regression Impact of Training & Development on Job Satisfaction (Public Sector)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.420[a]	.177	.160	.13939
a. Predictors: (Constant), Training_Development_Score				

Source: Author calculation using SPSS

Interpretation: R=.420 moderate positive correlation between training & development and job satisfaction for public sector employees with $R^2 = .177$ which indicates training & development score as a predictor of about 17.7% of the variation in the job satisfaction score of employees and adjusted $R^2 = .160$ makes it reasonable and acceptable.

Table 3b: ANOVA of Regression – Public Sector

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.200	1	.200	10.308	.002[b]
	Residual	.933	48	.019		
	Total	1.133	49			
a. Dependent Variable: Job_Satisfaction_Score						
b. Predictors: (Constant), Training_Development_Score						

Source: Author calculation using SPSS

Interpretation: Since F value =10.308 and p value = .002 (statistically significant), it indicates that regression model is statistically significant that training and development significantly impacts job satisfaction of public sector employee in solar energy sector of Uttar Pradesh

Table 3c: Regression Coefficients – Public Sector

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.722	.410		6.632	.000
	Training Development Score	.308	.096	.420	3.211	.002
a. Dependent Variable: Job_Satisfaction_Score						

Source: Author calculation using SPSS

Interpretation: As the overall regression model is significant with p value = .002, following interpretation can be made:

- Training and development have a significant positive effect on job satisfaction.
- For every additional unit increase in training and development score, job satisfaction increases by about 0.308 points.
- The predictor contributes moderately to explaining variation in job satisfaction (Beta = 0.420).
- The model intercept is 2.722, meaning when training and development is zero, the predicted job satisfaction score starts around 2.722

Regression Equation; Based on above unstandardized beta value of coefficients from SPSS output, the regression equation for private sector is

Job Satisfaction Score=2.722+0.308× (Training and Development Score)

The regression analysis conducted on the sample of public sector employees in the solar energy sector of Uttar Pradesh reveals a statistically significant and positive impact of training and development on job satisfaction. The model explains approximately 17.7% of the variance in job satisfaction scores (Adjusted R^2 = 0.160), indicating a moderate explanatory power. The ANOVA test confirms the model's significance (F = 10.308, p = 0.002), and the training and development predictor shows a positive coefficient (B = 0.308, p = 0.002), suggesting that job satisfaction increases by 0.308 units for every unit increase in training and development score. These findings reflect the importance of training initiatives in enhancing employee job satisfaction within public sector solar energy companies in Uttar Pradesh.

Private Sector Regression Output-

The following tables show the result of regression analysis in order to evaluate the impact of training and development on job satisfaction of private sector employees in solar energy sector of Uttar Pradesh

Table 4a: Model Summary of Regression Impact of Training & Development on Job Satisfaction (Private Sector)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.365[a]	.133	.115	.20329
a. Predictors: (Constant), Training_Development_Score				

Source: Author calculation using SPSS

Interpretation: R = 0.365 indicates a moderate positive correlation between training and development and job satisfaction for private sector employees, with R^2 =.133 which indicates 13.3% of the variation in job satisfaction scores is explained by training and development in the private sector and adjusted R^2 = .115 makes it modest and acceptable..

Table 4b: ANOVA of Regression Private Sector

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.305	1	.305	7.392	.009[b]
	Residual	1.984	48	.041		
	Total	2.289	49			
a. Dependent Variable: Job_Satisfaction_Score						
b. Predictors: (Constant), Training_Development_Score						

Source: Author calculation using SPSS

Interpretation: Since F value =7.392 and p value = .009 (statistically significant), it indicates that regression model is statistically significant that training and development significantly impacts job satisfaction of private sector employee in solar energy sector of Uttar Pradesh.

Table 4c: Regression Coefficients – Private Sector

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.731	.362		4.783	.000
	Training_Development_Score	.287	.106	.365	2.719	.009
a. Dependent Variable: Job_Satisfaction_Score						

Source: Author calculation using SPSS

Interpretation: As the overall regression model is significant with p value = .002, following interpretation can be made:

- Training and development have a significant positive effect on job satisfaction.
- For every additional unit increase in training and development score, job satisfaction increases by about 0.287 points.
- The predictor contributes moderately to explaining variation in job satisfaction (Beta = 0.365).
- The model intercept is 1.731, meaning when training and development is zero, the predicted job satisfaction score starts around 1.731

Regression Equation; Based on above unstandardized beta value of coefficients from SPSS output, the regression equation for private sector employee is

Job Satisfaction Score=1.731+0.287× (Training and Development Score)

The regression analysis conducted on the sample of private sector employees in the solar energy sector of Uttar Pradesh reveals a statistically significant and positive impact of training and development on job satisfaction. The model explains approximately 13.3% of the variance in job satisfaction scores (Adjusted R^2 = 0.115), indicating a modest explanatory power. The ANOVA test confirms the model's significance (F = 7.392, p = 0.009), and the training and development predictor shows a positive coefficient (B = 0.287, p = 0.009), suggesting that job satisfaction increases by 0.287 units for every unit increase in training and development score. These findings underscore the role of training and development initiatives in improving job satisfaction among private sector employees in the solar energy sector of Uttar Pradesh.

Step 2: Descriptive statistics: This step is to summarise and compare the central tendency and dispersion of the Training Development Score and Job Satisfaction Score between public and private sector employees. Through measures such as mean, median, standard deviation, and range for each sector, it will provide a clear view of the overall level and variability of training and development practices as well as job satisfaction in both sectors. Results of descriptive statistics of both sectors is presented in following tables:

Table 5a: Case Processing Summary – Training & Development and Job Satisfaction Scores (Public & Private Sector Employees)

Case Processing Summary							
		Cases					
		Valid		Missing		Total	
	Sector	N	Percent	N	Percent	N	Percent
Training_Development_Score	Public Sector	50	100.0%	0	0.0%	50	100.0%
	Private Sector	50	100.0%	0	0.0%	50	100.0%
Job_Satisfaction_Score	Public Sector	50	100.0%	0	0.0%	50	100.0%
	Private Sector	50	100.0%	0	0.0%	50	100.0%

Source: Author calculation using SPSS

Table 5b: Descriptive Statistics – Training & Development and Job Satisfaction Scores (Public & Private Sector Employees)

Descriptives

Variable	Sector	Mean	Median	Std. Dev.	Min	Max	Range
Training Development Score	Public Sector	4.2800	4.25	0.2060	4.00	4.88	0.88
Training Development Score	Private Sector	3.4175	3.38	0.2750	3.00	4.00	1.00
Job Satisfaction Score	Public Sector	4.0375	4.00	0.1521	3.63	4.38	0.75
Job Satisfaction Score	Private Sector	2.7125	2.75	0.2161	2.25	3.00	0.75

Source: Author calculation using SPSS

Interpretation: Based on descriptives statistics of both the public sector and private sector employees of solar energy sector of Uttar Pradesh, following information regarding training and development as well as job satisfaction are concluded for both sectors.

[A] Training & Development Score: In context of training and development score following results were interpreted sector wise

1. Public Sector

- Mean score = 4.28, being very high, it indicates that public sector employees perceive excellent training and development opportunities.
- Median =4.25, being close to the mean, suggests a symmetric distribution without extreme skewness.
- Standard. Deviation = (0.206) states low variability, meaning most public sector employees rated TD consistently high.
- Range= .88, stating uniformity of responses from all public sector employees

2. Private Sector

- Mean score: = 3.4175, stating moderate rating, which indicates comparatively lower satisfaction with training and development opportunities than public sector
- Median score =3.375 which is almost identical to mean, confirming symmetry in responses.
- Standard. Deviation = .275, which is slightly higher spread than public sector, showing more varied opinions.
- Range = 1, which means training quality perception varies more among private sector employees.

From the above descriptives of both the sectors regarding training and development score it is concluded that public sector employees rate training and development much higher than private sector employees. And their ratings are more consistent and tightly clustered, indicating a shared perception of strong training facilities. Whereas Private sector ratings are not only lower regarding training and development but also more spread out as compared to public sector employee responses.

[B] Job Satisfaction Score: In context of job satisfaction score following results were interpreted sector wise

1. Public Sector

- Mean score = 4.03, indicating high overall job satisfaction
- Median score = 4, consistent with the mean, suggesting uniformity.
- Standard Deviation = .1521, showing very low variability, which indicates that most employees share similar positive satisfaction levels.
- Range = .75, indicating narrow range, reinforcing that employees' views are closely aligned

2.Private Sector

- Mean score = 2.7125, considerably lower job satisfaction compared to public sector.
- Median score = 2.75, closely matches mean, showing a balanced spread of responses.
- Standard Deviation = .216, slightly more varied response as compared to that of public sector.
- Range = .75, identical to public sector, but concentrated in lower satisfaction scores.

From the above descriptives of both the sectors regarding job satisfaction score it is concluded that public sector employees report significantly higher job satisfaction than private sector employees wherein public sector employees rating is clustered towards higher end, showing widespread positive trend whereas Private sector employees ratings cluster in the lower range, indicating general dissatisfaction, with only minor variation.

Step 3: Independent Sample T-test: To statistically determine whether there is a significant difference in the mean Training and Development (TD) scores and Job Satisfaction (JS) scores between employees of public sector and private sector solar energy companies in Uttar Pradesh. Result of the above t test is stated as follows:

Table 6a: Group Statistics – Training & Development and Job Satisfaction Scores (Public & Private Sector Employees)

Group Statistics					
	Sector	N	Mean	Std. Deviation	Std. Error Mean
Training Development Score	Public Sector	50	4.2800	.20603	.02914
	Private Sector	50	3.4175	.27503	.03890
Job Satisfaction Score	Public Sector	50	4.0375	.15205	.02150
	Private Sector	50	2.7125	.21614	.03057

Source: Author calculation using SPSS

Table 6b: Independent Sample t-Test – Comparison of Training & Development and Job Satisfaction Scores between Public and Private Sector Employees

Independent Sample Test

Variable	Levene's Test for Equality of Variances		t-test for Equality of Means					
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
Training Development Score	6.351	.013	17.747	98	.000	0.86250	0.04860	Lower = 0.76606, Upper = 0.95894
Job Satisfaction Score	11.730	.001	35.454	98	.000	1.32500	0.03737	Lower = 1.25084, Upper = 1.39916

Source: Author calculation using SPSS

Interpretation: The above test was conducted to compare the mean scores of Trainings and Development and Job Satisfaction between employees working in the public and private sector solar energy companies in Uttar Pradesh for which results are as follows:

[A] Training and Development: In context of training and development practices following results were derived:

- Public sector employees reported a significantly higher mean score (M = 4.28, SD = 0.206) compared to private sector employees (M = 3.4175, SD = 0.275).
- The difference of 0.8625 was statistically significant ($t = 17.747$, $p < 0.001$), indicating that public sector employees rate their training and development opportunities far more positively than private sector employees.
- The higher score and lower variability in the public sector suggest consistent and stronger training and development practices.

Overall Public sector employees report significantly better training and development practices than private sector employees, and this difference is large and consistent.

[B] Job Satisfaction: In context of job satisfaction following results were derived;

- Public sector employees also showed a significantly higher mean job satisfaction score (M = 4.0375, SD = 0.152) compared to private sector employees (M = 2.7125, SD = 0.216).
- The mean difference of 1.325 was statistically significant ($t = 35.454$, $p < 0.001$), highlighting a substantial gap in job satisfaction between the sectors.

- This result supports the argument that better training and development in the public sector contributes to higher employee satisfaction.

From this it can be stated that public sector employees have significantly higher job satisfaction compared to private sector employees, with the gap being even larger than for Training and development scores. Overall, both Training and development score and Job satisfaction score show strong, statistically significant differences between public and private sector employees in the solar energy sector of Uttar Pradesh. In both cases, public sector employees score substantially higher, indicating better training and development practices as well as higher job satisfaction in the public sector.

As all the three test were used to compare the impact of training and development on job satisfaction between public and private sector employees in the solar energy sector of Uttar Pradesh. Considering the regression outcomes, descriptive statistics, and t-test results collectively, it is evident that training and development significantly impacts job satisfaction in both public and private sectors. However, this impact is more pronounced in the public sector, where employees report higher and more consistent satisfaction levels.

Therefore, the findings lead to the acceptance of the alternate hypothesis (H_{12}) which indicates that there is a significant difference in the impact of training and development on job satisfaction between public and private sector employees in the solar energy sector of Uttar Pradesh, with the public sector showing a stronger positive effect, stating that job satisfaction of employees working in public sector companies of solar energy sector of Uttar Pradesh is higher as compared to private sector companies of same due to better training and development practices

Objective 3: To recommend ways to enhance job satisfaction among public and private sector employees in solar energy sector of Uttar Pradesh through effective Training and Development strategies.

The statistical analysis conducted under Objective 1 established a strong positive relationship between training and development and job satisfaction among employees in the solar energy sector of Uttar Pradesh. Furthermore Objective 2 revealed that while this relationship exists in both public and private sector companies wherein the public sector demonstrates a stronger and more consistent positive impact, as indicated by higher mean scores and stronger regression coefficients.

Based on these findings, it is essential to formulate targeted strategies for both sectors to enhance employee job satisfaction by strengthening training and development practices, which are as follows sector wise:

[A] For Public Sector Solar Energy Companies

- Update and Modernize Training Content: Public sector solar energy companies should regularly revise training modules including new solar technologies, green energy policies, and smart energy solutions, ensuring employees to remain industry-relevant.
- Integrate More Hands-on Training Opportunities: Companies should try to increase field visits, live project work, and simulation exercises to strengthen the practical application of knowledge of employees.
- Strengthen Feedback and Evaluation Systems: Proper detailed feedback from employee participants should be taken after training and measure post-training performance improvements should be encouraged as well as implemented from time to time.
- Encourage Continuous Learning through E-Learning Platforms: Companies should try to provide free or subsidized access to online courses, webinars, and certifications from reputed energy and technical institutions to enhance employee's vocational training.
- Recognize and Reward Skill Upgradation: A proper recognition programs for employees who successfully complete advanced training should be entertained linking it to employee's promotions or incentives thereby enhancing their job satisfaction
- Expand Cross-functional Training- Companies should also try to offer rotational programs between departments (e.g., R&D, installation, maintenance) to broaden skills development among workforce and reduce operational barriers if any.

- Collaborate with Industry Leaders and Institutions- Companies should try to get in collaboration with universities, research bodies, and leading solar companies to bring cutting-edge practices into the training curriculum.

[B] For Private Sector Solar Energy Companies

- Increase Structured and Formalized Training Investments- Private solar energy companies should move away from traditional one -off training programs towards regular, scheduled sessions with measurable objectives inclined towards modern approach for regular upgradation of employee's training.
- Align Training with Career Development Plans Companies should try to link training modules of company with defined promotion pathways and skill-based role advancements to boost employee motivation thereby increasing job satisfaction of employees.
- Engage Qualified Trainers and Industry Experts- Companies should try to bring in certified professionals, experienced engineers, or industry leaders in training programs of company to ensure high-quality learning experiences of employees
- Adopt Blended Learning Approaches- Companies should try to combine in-person workshops, e-learning modules, and on-the-job training to provide flexibility without compromising quality.
- Implement Pre- and Post-Training Assessments- Companies should measure knowledge and skill levels before and after training to track effectiveness and return on training investment in order to take corrective steps if necessary
- Introduce Mentorship and Peer-learning Programs-Training program should be such which pair less experienced staff with senior employees to transfer tacit knowledge and improve team collaboration.
- Evaluate and Improve Training Infrastructure- Private sector solar energy companies should try to invest in better training facilities, updated tools, and access to the latest solar equipment for more effective learning.

VI. FINDINGS

Following findings were derived from the study:

- There is a strong positive correlation between training and development and job satisfaction ($\rho = 0.848$, $p < 0.01$) in the solar energy sector of Uttar Pradesh.
- Training and development significantly predict job satisfaction in both public and private sectors, but the effect is stronger in the public sector.
- Public sector employees report higher mean scores for both training & development (4.28) and job satisfaction (4.04) compared to private sector employees (3.42 and 2.71 respectively).
- Independent samples t-tests confirmed statistically significant differences between sectors for both training & development and job satisfaction ($p < 0.001$), favouring the public sector.
- Sector-specific recommendations were developed to enhance job satisfaction through more effective training and development practices for both public and private sector companies in solar energy sector of Uttar Pradesh

VII CONCLUSION

The present study examined the impact of training and development on job satisfaction among employees in select public and private sector companies in the solar energy sector of Uttar Pradesh. The results revealed a strong and significant positive relationship between training and development and job satisfaction across the sector, confirming that well-designed training initiatives contribute meaningfully to employee satisfaction. Regression analysis demonstrated that, while this relationship exists in both public and private sectors, the effect is more pronounced in the public sector, where employees reported higher and more consistent satisfaction levels. Descriptive statistics further highlighted that public sector employees rated both training and development practices and overall job satisfaction significantly higher than their private sector counterparts. Independent samples t-tests confirmed these differences to be statistically significant.

These findings led to the acceptance of the alternate hypotheses for the first two objectives and informed

the development of sector-specific strategies under to strengthen training and development practices as a pathway to improving job satisfaction. Overall, the study underscores the critical role of continuous, structured, and well-aligned training programs in fostering a motivated and satisfied workforce in the solar energy sector, with a call for targeted improvements, particularly in the private sector.

VIII. LIMITATIONS

The study ha following limitations which are stated as follows:

- The study focuses only on the solar energy sector in Uttar Pradesh, and findings may not be directly applicable to other states or regions.
- The study relies on participant self-assessment, which may be influenced by personal biases
- The research captures data at a single point in time, limiting the ability to assess changes or long-term impacts of training on job satisfaction.
- The study examines only training and development as a determinant of job satisfaction, while other influencing factors (e.g., salary, work environment, leadership) are not explored in this study.

REFRENCES

[1] M. N. Zubairi (2018), "THE EFFECT OF TRAINING AND DEVELOPMENT ON JOB SATISFACTION, SKILL ENHANCEMENT AND MOTIVATION OF EMPLOYEES" International Journal of Research GRAN THAALAYA, https://doi.org/10.29121/granthaalayah.v6.i11.2018.1130.

[2] Rimjhim Jha (2020), "EFFECT OF TRAINING AND DEVELOPMENT ON JOB SATISFACTION OF NURSES IN PUBLIC AND PRIVATE HOSPITALS IN INDIA", Academy of Strategic Management Journal, Volume 19, Issue 4, 2020.

[3] Sharma, V., Raj, S., & Kumar, A. (2023). Impact of Training & Development on Job Satisfaction in IT Sector in India. Journal of Interdisciplinary Research. https://jier.org/index.php/journal/article/view/190

[4] Jahnavi, S. C. (2019), "Impact of Training and Development on Employee Development Aspect of Job Satisfaction at Amara Raja Batteries Pvt Ltd." (International Journal of Advance Research, Ideas and Innovations in Technology - IJARIIT) Volume 5, Issue 3, 2019,

[5] Md. Atikur RAHAMAN1 (2022), "The Effect of Promotion and Job Training on Job Satisfaction of Employees: An Empirical Study of the SME Sector in Bangladesh", Journal of Asian Finance, Economics and Business Vol 9 No 2 (2022).

[6] Chaudhary & Bhaskar (2016), "Training and Development and Job Satisfaction in Education Sector", II STE Journal of Resources Development and Management, ISSN 2422-8397

[7] Pandey (2020), "A Comparative Study of Job Satisfaction of Private and Public Sector Managers" http://dx.doi.org/10.13140/RG.2.2.33506.71362/1

[8] Sumangala C (2016), "THE IMPACT OF TRAINING ON EMPLOYEE JOB SATISFACTION AND JOB PERFORMANCE - A COMPARATIVE STUDY OF PRIVATE SECTOR AND PUBLIC SECTOR BANKS", IJMIE, Vol 6, issue 8, ISSN: 2249-0558

[9] Priyanka Singha (2016), "Job Satisfaction: A Comparative Analysis of Private and Public Sector Teachers of District West Bengal, India", International Journal of Indian Psychology, DOI: 10.25215/0303.070