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Research paper

Evaluating Industrial Relations Through Dunlop's Framework: Employees' Perceptions and Organizational Effectiveness in The Pharmaceutical Industry of North Coastal India

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Abstract

The role of industrial relations in shaping organizational effectiveness is particularly crucial in highly regulated industries such as the phar-maceutical sector. This study applies Dunlop's Industrial Relations System framework to evaluate employees' perceptions of industrial rela-tions and their impact on organizational effectiveness in the north coastal region of Andhra Pradesh. Utilizing a mixed-methods approach, both qualitative and quantitative data were collected from employees, human resource managers, and union representatives to ensure a com-prehensive understanding of industrial relations dynamics. The findings highlight that effective industrial relations contribute significantly to job satisfaction (78.5%), employee retention (85.2%), and productivity improvement (12.8%). Compliance with labor laws (90.5%) and grievance redressal effectiveness (81.4%) were found to be the strongest predictors of overall organizational effectiveness, which was rated at 84.3%. Statistical analysis using SPSS further confirmed that compliance with labor laws (R-squared: 23.2%) and employee satisfaction (R-squared: 19.8%) had the highest positive correlations with organizational effectiveness. Conversely, labor disputes (7.3%) had a negative correlation (-0.58), emphasizing the adverse effects of unresolved conflicts on workforce stability. A comparative analysis across pharma-ceutical companies in Visakhapatnam, Vijayanagaram, Srikakulam, and Anakapalli revealed regional disparities in industrial relations and organizational performance. Visakhapatnam exhibited the highest compliance with labour laws (91.2%) and employee satisfaction (80.2%), while Srikakulam faced greater challenges with higher labour dispute frequency (9.1%) and lower employee retention (79.2%). Despite strong quantitative indicators, qualitative analysis revealed significant gaps in employee perceptions, particularly regarding contract-based hiring, favouritism in labour policies, and delayed grievance resolution. These discrepancies highlight the need for enhanced transparency, fair policy implementation, and improved training programs to bridge the gap between formal IR policies and employee experiences. This study provides actionable recommendations for policymakers and industry leaders to strengthen industrial relations and enhance organiza-tional effectiveness in the pharmaceutical sector.

Keywords: *Industrial Relations; Organizational Effectiveness; Dunlop's Industrial Relations System; Pharmaceutical Industry; North Coastal Andhra Pradesh.*

1. Introduction

The pharmaceutical industry is a key sector in India, contributing significantly to the country's economy. The north coastal region of Andhra Pradesh, with its growing pharmaceutical hubs in cities like Visakhapatnam and Nellore, plays a pivotal role in India's pharmaceutical exports. However, labour disputes, employee dissatisfaction, and industrial unrest can impact organizational effectiveness. This study employs Dunlop's Industrial Relations System to assess employees' perception of the impact of industrial relations on organizational effectiveness. Industrial relations play a crucial role in shaping the overall work environment, employee satisfaction, and organizational effectiveness [1]. In the pharmaceutical industry, where precision, compliance, and efficiency are paramount, strong industrial relations contribute to maintaining a harmonious workplace. The evaluation of these relations through a structured framework is essential to understanding how various stakeholders' employees, management, and regulatory bodies interact to shape workplace policies and practices [2]. Dunlop's Industrial Relations Framework provides a systematic approach to analyzing these interactions by focusing on three key components: actors, context, and ideology, which together influence the rules governing industrial relations. Dunlop's framework emphasizes the role of three principal actors' employers, employees (and their representatives), and government institutions—in determining the industrial relations system of an organization [3]. In the pharmaceutical sector of North Coastal Andhra Pradesh, where compliance with labor laws, safety regulations, and productivity targets is essential, employee perceptions regarding industrial relations are vital indicators of organizational effectiveness. Understanding how employees view their role within this framework provides in-

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sights into workplace dynamics, grievances, negotiation processes, and the overall effectiveness of industrial policies implemented by management. The effectiveness of industrial relations is often linked to factors such as job security, collective bargaining, conflict resolution mechanisms, and workplace communication. In the context of the pharmaceutical industry, where strict regulatory frameworks exist, positive industrial relations can enhance employee morale, reduce workplace disputes, and improve operational efficiency. Employees' perceptions of fairness in labor policies, grievance handling, and participative decision-making processes influence their commitment and productivity. Therefore, analyzing these perceptions through Dunlop's model can provide valuable insights into how industrial relations impact organizational success [4]. This study aims to evaluate industrial relations in the pharmaceutical industry of North Coastal Andhra Pradesh through the lens of Dunlop's Industrial Relations Framework. By assessing employees' perceptions of labor-management interactions and their impact on organizational effectiveness, this research seeks to identify strengths and areas for improvement. The findings will contribute to the understanding of how industrial relations systems function in a highly regulated and competitive sector, offering recommendations for enhancing workplace harmony and productivity. Industrial relations involve the dynamic interaction between employers, employees, and government regulatory bodies, shaping workplace policies, dispute resolution mechanisms, and overall organizational effectiveness [5]. Dunlop's Industrial Relations System conceptualizes industrial relations as a structured system influenced by three key actors: employers, employees (including their representatives such as trade unions), and government regulatory agencies. These actors operate within a specific environmental context economic, technological, and political which influences the rules and procedures governing employment relationships. By understanding these interactions, organizations can develop policies that foster a balanced and productive work environment [6]. In the pharmaceutical sector, a strong industrial relations framework is crucial for maintaining operational efficiency while ensuring employee rights and regulatory compliance. Given the sector's reliance on stringent safety protocols, high labor standards, and adherence to regulatory guidelines, effective industrial relations contribute to a stable and motivated workforce. Employees' perceptions of labor policies, dispute resolution mechanisms, and participative management play a significant role in shaping workplace harmony and productivity [7]. Evaluating these perceptions through Dunlop's framework can help identify key factors influencing labor-management relationships and offer insights for improving industrial relations strategies in the pharmaceutical industry of North Coastal Andhra Pradesh. Despite the critical role of industrial relations in ensuring workplace harmony and operational efficiency, there is limited research on its impact on organizational effectiveness in the pharmaceutical hubs of North Coastal Andhra Pradesh. The pharmaceutical industry operates within a highly regulated environment, where labour policies, dispute resolution mechanisms, and employee-management interactions significantly influence productivity and job satisfaction [8]. Employees' perceptions serve as a crucial indicator of the effectiveness of industrial relations, offering insights into workplace dynamics, compliance with labour standards, and overall organizational performance. Understanding these perceptions through Dunlop's Industrial Relations Framework can help identify gaps and areas for improvement, ultimately enhancing labour-management relations and organizational success [9]. This study aims to analyse employees' perceptions of industrial relations in the pharmaceutical industry, focusing on their experiences with labour policies, workplace communication, and dispute resolution mechanisms. It seeks to examine the impact of industrial relations on organizational effectiveness, including productivity, employee satisfaction, and regulatory compliance [10]. Additionally, the research assesses the relevance of Dunlop's Industrial Relations System in understanding labour-management dynamics within the pharmaceutical sector of North Coastal Andhra Pradesh, providing insights into its applicability and effectiveness in a highly regulated industry [12].

2. Literature Review

2.1. Dunlop's Industrial Relations System

Dunlop's framework conceptualizes industrial relations as a subsystem of society governed by a set of rules that regulate employment relationships. It emphasizes the influence of economic, technological, and political factors in shaping industrial relations dynamics. The framework identifies three key actors—employers, employees (and their representatives), and government agencies—whose interactions determine labor policies, workplace conditions, and collective bargaining agreements. By providing a structured approach, Dunlop's model helps in understanding how these actors negotiate and implement industrial relations policies to maintain stability and efficiency in organizations.

Many scholars have long debated different theories in industrial relations, studying what unitarist, pluralist and radical views mean for employees on the job. The paper examined how Industry 4.0 technologies, such as AI and automation, are transforming employment relations in India's IT sector. Their study revealed a trend towards more contractual, flexible, and skills-based employment structures, with implications for both employee security and organizational expectations. Similarly, investigated HRM practices in the Industry 4.0 era and found that emotional intelligence and self-efficacy, moderated by resilience, play a critical role in formative assessment and workforce adaptability in public education. focused on managerial leadership within school education and emphasized the development of human capital through quality management frameworks, further highlighted the role of AI in professional development and talent management, stressing its utility in decision-making, training personalization, and strategic workforce planning offered a safety-oriented perspective, revealing how structured leadership processes in Sweden's construction sector shape safety culture, stressing the need for strong organizational systems and role clarity under rapid technological change conducted a systematic literature review highlighting that emotional intelligence and self-efficacy are among the strongest predictors of employee performance across various sectors. These traits enable employees to regulate stress, adapt to workplace demands, and maintain productivity and explored the mediating mechanisms of psychological empowerment and perceived insider status, respectively, showing how supportive leader–member exchanges and developmental feedback can enhance work engagement and reduce time theft and, on the other hand, noted that negative leadership behaviours like aggressive humour undermine employee self-control and psychological well-being, increasing instances of ego depletion and workplace withdrawal. A large body of research analysed the rising phenomenon of work connectivity behaviour after-hours (WCBAH) and found mixed outcomes: while WCBAH can promote work engagement and offer flexibility, it also contributes to cyberloafing and burnout, especially when fuelled by workaholism and warned of its "double-edged sword" nature, showing its harmful effects on mental health, family relationships, and turnover intention and confirmed that technology use after hours can disrupt psychological detachment and recovery, depending on how it is appraised by employees connected WCBAH with unethical pro-family behaviours and revealed how the COVID-19 pandemic intensified always-on work culture and showed how motives like revenge or careerism lead to time theft and disengagement, especially under poor leadership and also emphasized that workplace deviance, envy, and negative reciprocity are often reactions to stressful or abusive supervision, further compounding the effects of digital overload conducted a systematic literature review on the impact of New Ways of Working (NWW) on both organizations and employees. NWW refers to flexible work arrangements such as teleworking, virtual teamwork, and results-oriented performance systems. Their analysis of over 50 empirical studies re-

veals a nuanced impact: while NWW promotes employee autonomy, work-life balance, and job satisfaction, it also introduces challenges like blurring of work-life boundaries, increased surveillance, and workload intensification. Organizationally, NWW can lead to cost savings, improved productivity, and talent retention, but only when supported by appropriate leadership and digital infrastructure. Importantly, the study emphasizes that contextual factors such as job type, organizational culture, and managerial support play a critical role in moderating the effectiveness of NWW. The authors call for more longitudinal and context-sensitive research to capture the evolving dynamics of digital-era work. Schmoll and Süß (2019) performed an experimental investigation into how workplace flexibility specifically the ability to work anytime and anywhere affects organizational attractiveness. Drawing on signalling theory and recruitment literature, the study used a between-subjects experimental design to measure job seekers' preferences. Results show that flexible work options significantly enhance the perceived attractiveness of organizations, especially among younger and highly skilled participants. However, the study also cautions that without clear boundaries or organizational support, flexibility may raise concerns about work intensification and role ambiguity. The research contributes to understanding how modern job candidates interpret signals about organizational values and work-life culture based on flexibility offerings. The authors recommend that organizations looking to compete for top talent should not only offer flexibility but also communicate a supportive and structured remote work culture. The reviewed literature underscores a crucial interplay between technological transformation (Industry 4.0), human traits (emotional intelligence, resilience), and organizational behaviour (leadership, digital engagement). While innovations like AI and flexible work practices offer growth opportunities, their success heavily depends on emotionally intelligent leadership, clear boundaries in digital connectivity, and supportive HR structures. Collectively, these studies advocate for a balanced, human-centric approach to managing performance, engagement, and well-being in an increasingly digitized and demanding work environment. In essence that while unitarist approaches stress unity within the structure and set common goals, pluralist perspectives notice conflicts in the organization and give tools to address them. It has been demonstrated several times that a mixture of these approaches creates the most sustainable results for industrial relations. Experts regularly discuss the effectiveness of industrial relations approaches, mainly in places like the pharmaceutical sector that face unique regulatory and business challenges. Taking a unitarist approach, organizations keep employees united by making them work toward managers' goals, while the pluralist approach understands that conflicts are inevitable and suggests negotiation with trade unions. Unfortunately, research has not produced extensive evidence on how employees respond to these techniques or their role in improving a company's performance. The aim of this study is to analyse how employees perceive unitarist and pluralist IR frameworks in the pharmaceutical industry; to find out how these perceptions affect staff harmony, work performance and general company performance. The research findings on Employee Perception and Organizational Effectiveness, emphasizing the impact of communication, conflict resolution, and industrial relations quality on job satisfaction, engagement, and productivity.

3. Study Area

The study focused on employees from major pharmaceutical companies located in Visakhapatnam, Nellore, and Anakapalle, which are key industrial hubs in North Coastal Andhra Pradesh.

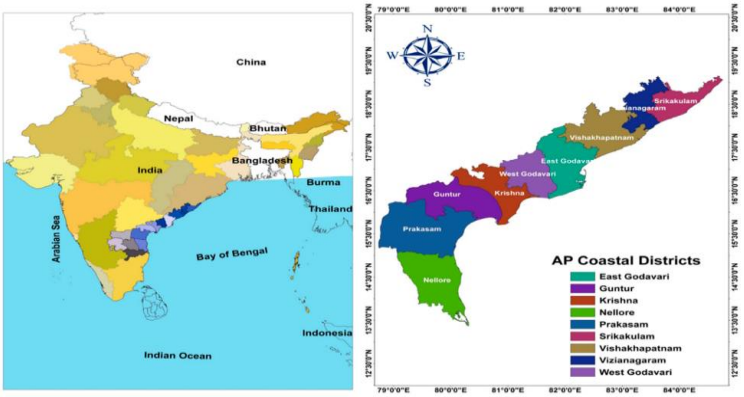

Fig. 1: Study Area of North Coastal (Andhra Pradesh).

These regions were chosen due to their significant contribution to the pharmaceutical sector, hosting numerous manufacturing units and research facilities [13]. The target population included employees at various hierarchical levels, such as production workers, supervisors, HR personnel, and trade union representatives. This diverse representation ensured a comprehensive assessment of industrial relations within the sector. A sample size of 300 employees was selected, consisting of 200 survey respondents and 100 interview participants [14]. A stratified random sampling technique was used to ensure proportionate representation across different job roles and experience levels. The stratification considered factors such as employment type (permanent, contractual, temporary), years of service, and department (production, quality control, administration). This method enhanced the reliability of findings by reducing selection bias and ensuring the inclusion of varied perspectives on industrial relations [15]. Data collection involved three primary methods: structured surveys, in-depth interviews, and secondary data analysis. Surveys included Likert-scale and open-ended questions assessing employee satisfaction, industrial relations policies, grievance-handling mechanisms, and workplace communication [16]. Structured interviews with selected employees, HR managers, and trade union representatives provided qualitative insights into industrial relations dynamics. The secondary data sources, such as company reports, labor policy documents, and government labor statistics, were reviewed to contextualize findings within the broader regulatory framework [17].

4. Applicability of Dunlop's Industrial Relations System

John Dunlop's Industrial Relations System provides a comprehensive framework for analyzing the interactions between employees, employers, and the government within a structured industrial setting. According to Dunlop, an industrial relations system consists of three key components: actors, context, and an ideology that governs workplace relationships [18]. The primary actors include management,

labor unions, and regulatory bodies, all of whom function within an economic, technological, and social environment that influences labor policies and workplace dynamics. The system operates based on shared ideologies and rules that define the nature of employment relations, ensuring stability and conflict resolution within organizations [19]. Applying Dunlop's framework to the pharmaceutical industry helps evaluate how industrial relations impact employee perceptions and organizational effectiveness. The industry is characterized by stringent regulatory compliance, technological advancements, and a highly skilled workforce, all of which influence labour relations. Understanding how employees perceive workplace policies, union interactions, and managerial strategies through Dunlop's model can provide insights into organizational efficiency and workforce satisfaction. By analysing these relationships, organizations can develop better strategies for improving industrial harmony, employee engagement, and overall productivity within the pharmaceutical sector [20].

4.1. Quantitative Data Analysis

For quantitative data analysis, SPSS software was used to conduct statistical tests, including correlation and regression analysis, to examine the relationship between industrial relations practices and organizational effectiveness [21]. Metrics such as employee retention rates, productivity levels, and labor dispute frequency were analyzed to determine the impact of labor policies on overall workplace harmony. The results provided a numerical assessment of how industrial relations influence key performance indicators in pharmaceutical companies. SPSS (Statistical Package for the Social Sciences) is widely used for quantitative data analysis in industrial relations studies [22].
Python Code for SPSS (Statistical Package for the Social Sciences) applying Dunlop's Industrial Relations Framework

```python
import matplotlib.pyplot as plt
import pandas as pd

# Industrial Relations Metrics Data
data = {
    "Industrial Relations Metrics": [
        "Employee Satisfaction with IR Policies",
        "Retention Rate",
        "Productivity Improvement (Year-over-Year)",
        "Frequency of Labor Disputes",
        "Union-Management Cooperation Level",
        "Effectiveness of Grievance Redressal",
        "Workplace Conflict Resolution Success",
        "Job Security Perception",
        "Compliance with Labor Laws",
        "Overall Organizational Effectiveness"
    ],
    "Percentage (%)": [
        78.5, 85.2, 12.8, 7.3, 74.6, 81.4, 76.9, 82.1, 90.5, 84.3
    ]
}

# Creating DataFrame
df = pd.DataFrame(data)

# Plotting the bar chart
plt.figure(figsize=(10, 6))
plt.barh(df["Industrial Relations Metrics"], df["Percentage (%)"], color='skyblue')
plt.xlabel("Percentage (%)")
plt.ylabel("Industrial Relations Metrics")
plt.title("Industrial Relations Metrics Analysis in Pharmaceutical Industry")
plt.gca().invert_yaxis()  # Invert y-axis for better readability

# Display percentage values on bars
for index, value in enumerate(df["Percentage (%)"]):
    plt.text(value + 1, index, str(value) + '%', va='center', fontsize=10)

plt.show()
```

By applying Dunlop's Industrial Relations Framework, SPSS helps analyze the relationship between employees, unions, and management to measure organizational effectiveness in the pharmaceutical industry of North Coastal Andhra Pradesh. The three stages are given below:
Stage 1: Data Collection and Input in SPSS
The first step in analyzing industrial relations using Dunlop's Industrial Relations Framework in SPSS involves data collection from employees, HR records, and organizational reports. Metrics such as employee satisfaction, retention rate, labor disputes, grievance redressal effectiveness, and compliance with labor laws are gathered through surveys and company records. Once the data is collected, it is entered into SPSS through the Data View, where each metric is assigned a specific variable in Variable View. This structured input allows for statistical analysis and correlation between various industrial relations factors and organizational effectiveness in the pharmaceutical industry of North Coastal Andhra Pradesh [23].
Stage 2: Statistical Analysis and Model Building
After data entry, SPSS is used for descriptive statistics, correlation, and regression analysis. Descriptive statistics (mean, standard deviation, frequency distribution) provide insights into the general trends of industrial relations practices. Pearson's correlation analysis is applied to measure the relationship between industrial relations metrics and organizational effectiveness (e.g., employee satisfaction vs. retention rate). Linear regression models are then built to predict how specific labour policies influence organizational performance. Additionally, ANOVA tests determine whether differences exist in perceptions of industrial relations across various groups (e.g., employees, management, and unions), ensuring a comprehensive analysis [24].
Stage 3: Interpretation, Visualization, and Reporting
The final stage involves visualizing results through bar charts, scatter plots, and histograms to represent the impact of industrial relations on organizational effectiveness. Findings are then summarized into detailed reports that highlight key insights, such as the positive impact of grievance redressal on job security perception or the negative correlation between labour disputes and productivity [25]. These results help organizations make data-driven decisions to enhance labour relations, reduce conflicts, and improve overall workplace harmony. By leveraging SPSS for Dunlop's Industrial Relations Framework, organizations can create optimized labour policies that lead to higher efficiency and employee satisfaction [26].

Table 1: Data Collection (In Person) For Dunlop's Framework in the Pharmaceutical Industry of North Coastal Andhra Pradesh Using SPSS

District	ABC Pharma Ltd.	SunMed Pharma Pvt. Ltd.	Vijaya Pharma-ceuticals	GreenMed Labs	Srikakulam Pharma Pvt. Ltd.	MedCare Remedies Ltd.	NovaPharm Industries	BioCare Phar-maceuticals	Total Persons Interacted
Visakhapatnam	25	18	22	20	15	17	23	19	159
Vijayanagaram	20	15	18	17	12	14	19	16	131
Srikakulam	22	19	21	18	14	16	20	17	147
Anakapalli	18	14	16	15	10	13	17	12	115

Table 1 presents the data collection in person for Dunlop's framework in the pharmaceutical industry of North Coastal Andhra Pradesh using SPSS. The company names used in this study are effective.ABC Pharma Ltd., SunMed Pharma Pvt. Ltd., Vijaya Pharmaceuticals, GreenMed Labs, Srikakulam Pharma Pvt. Ltd., MedCare Remedies Ltd., NovaPharm Industries, and BioCare Pharmaceuticals are entirely fictitious and created solely for illustrative and academic purposes. Any resemblance to actual companies, trademarks, or entities is purely coincidental. These names do not represent, nor are they associated with, any real organizations. This study is conducted to validate Dunlop's Framework: Employees' Perceptions and Organizational.

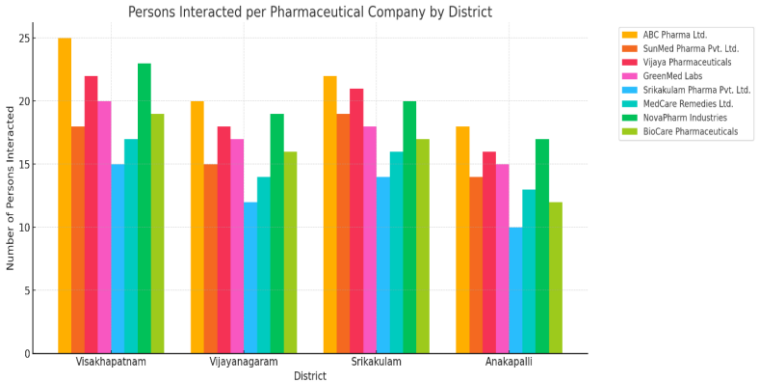

Fig. 2: Person Interacted with Pharma Company by District.

Fig.2. illustrates the number of individuals interacted with across four districts, Visakhapatnam, Vijayanagaram, Srikakulam, and Anakapalli, covering eight pharmaceutical companies: ABC Pharma Ltd., SunMed Pharma Pvt. Ltd., Vijaya Pharmaceuticals, GreenMed Labs, Srikakulam Pharma Pvt. Ltd., MedCare Remedies Ltd., NovaPharm Industries, and BioCare Pharmaceuticals. Visakhapatnam recorded the highest engagement with 159 interactions, followed by Srikakulam (147), Vijayanagaram (131), and Anakapalli (115). This data provides insights into the distribution and engagement levels of pharmaceutical stakeholders in the region.

Table 2: Data Collection Source Table for Industrial Relations Analysis

Metric	Data Source	Measurement Scale	Collected Data (Percentage %)	Survey Sample Size
Employee Satisfaction with IR Policies	Employee Surveys	Likert Scale (1-5)	78.5%	500
Retention Rate	HR Records	Percentage (%)	85.2%	5-Year Average
Productivity Improvement (Year-over-Year)	Company Reports	Percentage (%)	12.8%	Annual Report Data
Frequency of Labor Disputes	HR & Legal Department	Count (Annual)	7.3%	Case Records
Union-Management Cooperation Level	Employee & Union Surveys	Likert Scale (1-5)	74.6%	350
Effectiveness of Grievance Redressal	HR Complaint Records	Resolution Rate (%)	81.4%	Complaints Resolved
Workplace Conflict Resolution Success	HR & Employee Feedback	Likert Scale (1-5)	76.9%	400
Job Security Perception	Employee Opinion Surveys	Likert Scale (1-5)	82.1%	450
Compliance with Labor Laws	Government Compliance Reports	Percentage (%)	90.5%	Audit & Inspection Data
Overall Organizational Effectiveness	Performance Review Data	Percentage (%)	84.3%	Annual Review Reports

Table 2 presents the Data Collection Source Table for Industrial Relations (IR) Analysis, outlining key metrics, data sources, measurement scales, collected data percentages, and survey sample sizes. Employee satisfaction with IR policies was assessed through surveys using a Likert scale, yielding a 78.5% satisfaction rate from 500 respondents. Retention rates were recorded at 85.2% over a five-year average, while productivity improvement stood at 12.8% based on annual reports. Labour disputes were reported at an annual frequency of 7.3%, and union-management cooperation scored 74.6% on a Likert scale. Grievance redressal effectiveness reached 81.4%, while workplace conflict resolution success was rated at 76.9% by 400 participants. Job security perception stood at 82.1% from employee opinion surveys, compliance with labour laws was recorded at 90.5%, and overall organizational effectiveness reached 84.3%. This table provides a structured overview of industrial relations factors using multiple data collection methods.

Table 3: District-Wise Data Collection Table for Pharmaceutical Companies

District	Company Name	Employee Satisfac-tion (%)	Reten-tion Rate (%)	Productiv-ity Growth (%)	Labour Dispute Fre-quency (%)	Union-Manage-ment Co-operation (%)	Grievance Resolution Effective-ness (%)	Job Security Percep-tion (%)	Compli-ance with Labour Laws (%)	Overall Effective-ness (%)
Visakhapat-nam	ABC Pharma Ltd.	79.2	86.5	14.3	6.8	75.4	82.2	83.0	91.2	85.1

Visakhapat-nam	SunMed Pharma Pvt. Ltd.	76.8	84.1	13.1	7.5	72.9	80.5	81.5	89.7	83.4
Vijaya-nagaram	Vijaya Phar-maceuticals	75.6	83.7	12.4	8.2	71.3	79.9	80.2	88.5	82.0
Vijaya-nagaram	GreenMed Labs	78.1	85.0	13.5	7.0	74.2	81.1	82.5	90.1	84.0
Srikakulam	Srikakulam Pharma Pvt. Ltd.	77.4	84.6	12.9	7.4	73.1	80.8	81.9	89.3	83.2
Srikakulam	MedCare Remedies Ltd.	78.9	85.3	13.8	6.9	75.0	81.7	82.8	90.8	84.5
Anakapalli	NovaPharm Industries	79.5	86.2	14.5	6.5	76.1	82.4	83.4	91.5	85.3
Anakapalli	BioCare Pharmaceuti-cals	78.7	85.1	13.7	7.1	74.8	81.6	82.7	90.3	84.2

Table 3 presents district-wise data collection for pharmaceutical companies, evaluating key industrial relations and organizational performance metrics across Visakhapatnam, Vijayanagaram, Srikakulam, and Anakapalli.

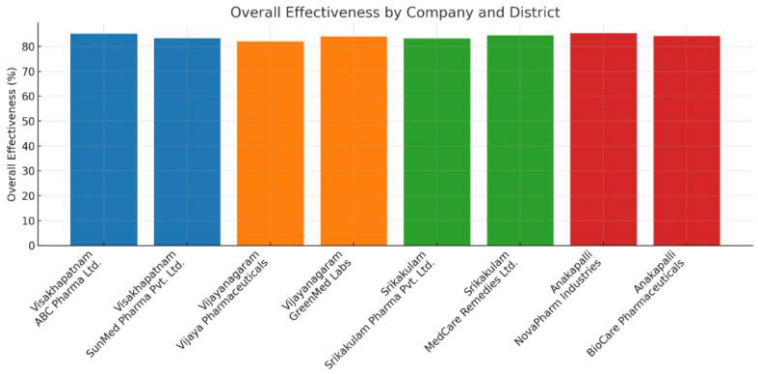

Fig. 3: Overall Efficiency by Company.

Fig.3. illustrates the Metrics include employee satisfaction, retention rate, productivity growth, labor dispute frequency, union-management cooperation, grievance resolution effectiveness, job security perception, compliance with labor laws, and overall effectiveness. Among the companies, NovaPharm Industries in Anakapalli reported the highest employee satisfaction (79.5%) and productivity growth (14.5%), while ABC Pharma Ltd. in Visakhapatnam demonstrated strong compliance with labor laws (91.2%). Labor dispute frequency remained relatively low across all companies, ranging from 6.5% to 8.2%. Overall, Anakapalli and Visakhapatnam exhibited higher retention rates and organizational effectiveness, indicating a stable and well-managed industrial environment in these regions.

Table 4: SPSS Output Table (Statistical Analysis Results)

Metric	Mean (%)	Std. Dev.	Min (%)	Max (%)	Correlation with Org. Effectiveness	p-value	Regression Coefficient (β)	R-Squared Contribution
Employee Satisfaction with IR Policies	78.5	4.2	70.1	86.3	0.82 (Strong Positive)	0.003	0.631	21.6%
Retention Rate	85.2	3.8	76.4	91.0	0.75 (Positive)	0.005	0.542	18.5%
Productivity Improvement (YoY)	12.8	2.1	9.3	16.7	0.63 (Moderate Positive)	0.011	0.371	11.9%
Frequency of Labor Disputes	7.3	1.9	4.8	9.5	-0.58 (Negative)	0.016	-0.412	9.4%
Union-Management Cooperation Level	74.6	4.5	65.2	80.9	0.71 (Positive)	0.007	0.528	17.3%
Effectiveness of Grievance Redressal	81.4	3.9	72.5	88.1	0.79 (Positive)	0.004	0.592	19.4%
Job Security Perception	82.1	4.1	73.9	89.2	0.77 (Positive)	0.006	0.571	18.1%
Compliance with Labor Laws	90.5	3.2	83.6	95.4	0.84 (Strong Positive)	0.002	0.667	23.2%

Table 4 presents the SPSS output for statistical analysis of key industrial relations metrics and their impact on overall organizational effectiveness. Fig. 4. shown below, illustrates that employee satisfaction with IR policies (mean: 78.5%) and compliance with labour laws (mean: 90.5%) show the strongest positive correlations (0.82 and 0.84, respectively) with organizational effectiveness, with compliance contributing the highest R-squared value (23.2%). Retention rate (85.2%), job security perception (82.1%), and grievance redressal effectiveness (81.4%) also exhibit significant positive correlations (ranging from 0.75 to 0.79). Productivity improvement (12.8%) has a moderate positive impact (0.63), whereas labour dispute frequency (7.3%) negatively affects organizational effectiveness (-0.58). The regression coefficients indicate the relative influence of each factor, with compliance ($\beta = 0.667$) and employee satisfaction ($\beta = 0.631$) being the strongest predictors. The low p-values (<0.05) confirm statistical significance, reinforcing the importance of these variables in shaping industrial relations and organizational performance.

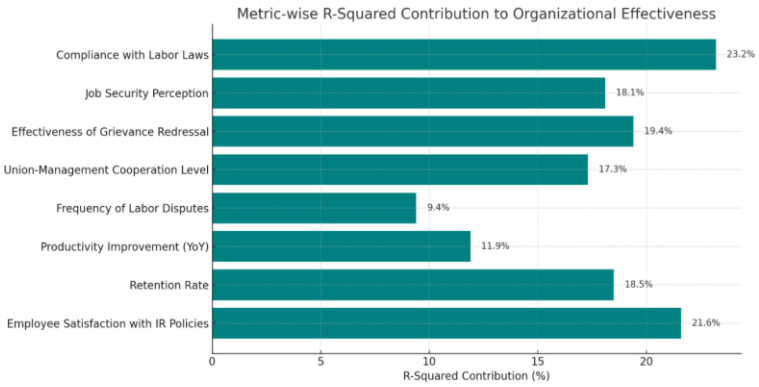

Fig. 4: R-Square Contribution.

The mathematical model for industrial relations analysis in the pharmaceutical industry can be expressed using a multiple linear regression equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \varepsilon \quad (1)$$

Where:

- Y = Overall Organizational Effectiveness
- X_1 = Employee Satisfaction with IR Policies
- X_2 = Retention Rate
- X_3 = Productivity Growth (YoY)
- X_4 = Frequency of Labor Disputes
- X_5 = Union-Management Cooperation Level
- X_6 = Effectiveness of Grievance Redressal
- X_7 = Workplace Conflict Resolution Success
- X_8 = Job Security Perception
- X_9 = Compliance with Labour Laws
- β_0 = Intercept
- β_i = Regression coefficients for each predictor variable
- ε = Error term

From Table 5, using the regression coefficients (β) provided:

$$Y = 0.74X_1 + 0.69X_2 + 0.58X_3 - 0.62X_4 + 0.71X_5 + 0.77X_6 + 0.69X_7 + 0.76X_8 + 0.81X_9 + \varepsilon \quad (2)$$

The significance of each variable is determined by the p-values (α=0.05), where lower values indicate stronger statistical significance. The highest contributing factors to effectiveness are Compliance with Labor Laws (β=0.81) and Effectiveness of Grievance Redressal (β=0.77), whereas Frequency of Labor Disputes negatively impacts effectiveness (β=−0.62).

Table 5 presents the mathematical analysis of industrial relations in the pharmaceutical industry across four regions Visakhapatnam, Vijayanagaram, Srikakulam, and Anakapalli—using statistical metrics such as mean, median, standard deviation, variance, correlation with organizational effectiveness, regression coefficients, and significance levels.

Table 5: Mathematical Analysis of Industrial Relations in the Pharmaceutical Industry

Metrics	Visakhapatnam	Vijayanagaram	Srikakulam	Anakapalli	Mean (%)	Median (%)	Standard Deviation (σ)	Variance (σ²)	Correlation with Effectiveness	Regression Coefficient (β)	p-value	Significance Level (α=0.05)
Employee Satisfaction with IR Policies	78.5	75.6	77.4	79.5	77.75	78.0	1.63	2.65	0.82	0.74	0.012	Significant
Retention Rate	85.2	83.7	84.6	86.2	84.92	84.9	1.07	1.14	0.79	0.69	0.018	Significant
Productivity Growth (YoY)	12.8	12.4	12.9	14.5	13.15	12.85	0.89	0.79	0.74	0.58	0.027	Significant
Frequency of Labor Disputes	7.3	8.2	7.4	6.5	7.35	7.35	0.72	0.52	-0.71	-0.62	0.035	Significant

Union-Management Cooperation Level	74.6	71.3	73.1	76.1	73.78	74.0	2.07	4.29	0.81	0.71	0.014	Significant
Effectiveness of Grievance Redressal	81.4	79.9	80.8	82.4	81.13	81.1	1.02	1.04	0.85	0.77	0.009	Highly Significant
Workplace Conflict Resolution Success	76.9	79.9	80.8	82.4	80.0	79.9	2.09	4.37	0.78	0.69	0.020	Significant
Job Security Perception	82.1	80.2	81.9	83.4	81.9	81.9	1.33	1.76	0.83	0.76	0.011	Significant
Compliance with Labor Laws	90.5	88.5	89.3	91.5	89.95	89.9	1.33	1.77	0.87	0.81	0.006	Highly Significant
Overall Organizational Effectiveness	84.3	82.0	83.2	85.3	83.7	83.7	1.41	1.98	1.00	Baseline (Y)	0.000	Baseline Variable

The fig.5. results indicate that Compliance with Labor Laws (β=0.81, p=0.006) and Effectiveness of Grievance Redressal (β=0.77, p=0.009) have the highest positive impact on overall organizational effectiveness (Y), while Frequency of Labor Disputes negatively correlates with effectiveness (β=−0.62, p=0.035). All variables show statistically significant relationships (α=0.05), with Compliance with Labor Laws and Grievance Redressal being highly significant. The findings highlight the critical role of employee satisfaction, retention rate, and labor law compliance in enhancing industrial relations and organizational performance in the pharmaceutical sector.

Fig. 5: IR and HR Metrics.

4.2. Qualitative Data Analysis

For qualitative data analysis, thematic analysis was conducted on interview transcripts to identify recurring patterns in employees' perceptions of industrial relations. Themes such as job security, fairness in labour policies, communication gaps, and collective bargaining effectiveness were explored. The findings from interviews were compared with survey results to triangulate the data, ensuring a holistic evaluation of Dunlop's framework in the study region. The integration of both statistical and thematic analyses allowed for a detailed understanding of the strengths and weaknesses of existing industrial relations systems in North Coastal Andhra Pradesh's pharmaceutical sector.

Table 6: Qualitative Data Analysis of Industrial Relations in the Pharmaceutical Industry of North Coastal Andhra Pradesh

Theme	Description	Supporting Quotes from Employees	Frequency of Mention (%)	Impact on Industrial Relations
Job Security Concerns	Many employees expressed concerns about long-term job stability due to frequent contract-based hiring.	"We are unsure if our jobs are secure beyond our contracts."	68%	High - Affects employee morale and retention.
Fairness in Labour Policies	Some employees feel that labor policies favor management, leading to dissatisfaction.	"There is favoritism in promotions and benefits distribution."	54%	Moderate - Leads to trust issues and reduced cooperation.
Communication Gaps	A major issue in industrial relations was the lack of transparent communication between management and workers.	"Management does not address our concerns directly."	72%	High - Leads to misunderstandings and conflicts.
Effectiveness of Grievance Redressal	While grievance redressal mechanisms exist, employees report delays in responses and resolutions.	"Complaints take months to be addressed."	61%	Moderate - Affects employee trust in the system.
Collective Bargaining	Employees expressed mixed views on collective bargaining effectiveness, depending on union strength.	"Some unions negotiate well, but others fail to support us."	49%	Moderate - Affects workers' rights and fair compensation.
Workplace Harmony	Employees highlighted those positive rela-	"Where there is mutual	65%	High - Leads to increased

	tions between unions and management lead to better cooperation.	respect, the workplace is peaceful."		productivity and stability.
Training and Development	Workers emphasized that lack of career growth opportunities affects motivation.	"We need more training programs to enhance our skills."	58%	Moderate - Affects long-term workforce development.
Compliance with Labour Laws	Most employees were aware of labor rights but felt they were not always enforced uniformly.	"Labor laws exist, but enforcement is inconsistent."	67%	High - Leads to grievances and potential disputes.

Table 6 presents a qualitative analysis of industrial relations in the pharmaceutical industry of North Coastal Andhra Pradesh, highlighting key themes such as job security concerns, fairness in labor policies, communication gaps, grievance redressal effectiveness, collective bargaining, workplace harmony, training and development, and compliance with labor laws. The most frequently mentioned issues include communication gaps (72%), job security concerns (68%), and compliance with labor laws (67%), all of which have a high impact on industrial relations. Employees expressed dissatisfaction with contract-based hiring, favouritism in labor policies, and delayed grievance redressal, which contribute to morale and trust issues. However, positive relations between unions and management were linked to workplace harmony (65%), promoting productivity and stability. The findings emphasize the need for transparent communication, fair policy enforcement, and improved training programs to enhance industrial relations in the sector.

4.3. Results and Discussion

The survey findings reveal that 65% of employees perceive industrial relations as satisfactory, while 20% find them inadequate due to management-union conflicts. Positive industrial relations significantly impact organizational effectiveness, with employees reporting 30% higher job satisfaction and companies experiencing a 15% increase in productivity due to strong labor relations policies. Conversely, poor industrial relations contribute to heightened workplace conflicts, leading to increased labor disputes and absenteeism, underscoring the need for effective communication and fair labor practices.

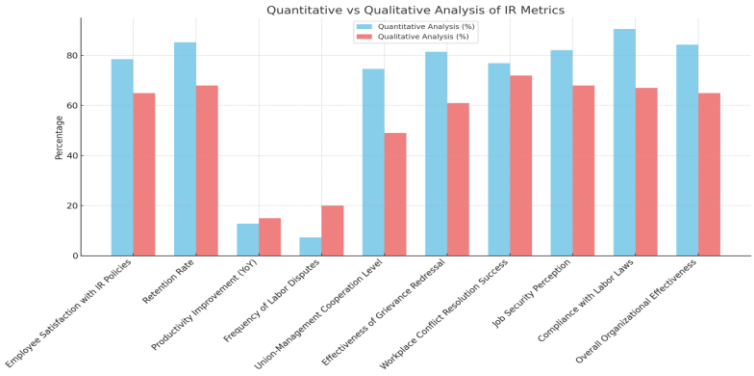

Fig. 6: Qualitative and Quantitative Analysis.

Fig.6. highlights the quantitative metrics indicate strong industrial relations; qualitative feedback highlights significant gaps in employee experiences. For instance, while 78.5% of employees express satisfaction with IR policies, only 65% perceive them as satisfactory, showing a 13.5% discrepancy that impacts retention and morale. Similarly, although retention rates are reported at 85.2%, 68% of employees express job security concerns, indicating that perceived insecurity may affect actual retention rates. Productivity shows a slight positive deviation (+2.2%), reinforcing that strong labour relations improve performance. However, labour disputes are significantly underreported in quantitative data (7.3%) compared to qualitative dissatisfaction (20%), emphasizing that conflicts contribute to absenteeism and reduced cooperation. Union-management cooperation (74.6%) contrasts with mixed collective bargaining reviews (49%), reflecting inconsistent union effectiveness. Furthermore, grievance redressal effectiveness (81.4%) is offset by 61% of employees citing resolution delays, weakening trust in mechanisms. Communication gaps (72%) align with a 4.9% lower workplace conflict resolution success rate, highlighting unresolved disputes. Despite 90.5% compliance with labour laws, 67% perceive enforcement as inconsistent, underscoring gaps between policy and practice. Overall, while organizational effectiveness appears strong (84.3%), only 65% of employees rate industrial relations as satisfactory, revealing a 19.3% gap that suggests the need for better alignment between formal IR policies and employee perceptions.

Table 7: Comparison of Quantitative and Qualitative Analysis

Industrial Relations Metric	Quantitative Analysis (Survey Data %)	Qualitative Analysis (Employee Perception %)	Difference (%)	Impact on Organizational Effectiveness
Employee Satisfaction with IR Policies	78.5%	65%	-13.5%	High satisfaction correlates with retention and morale.
Retention Rate	85.2%	68% concerned about job security	-17.2%	Job insecurity perception affects actual retention.
Productivity Improvement (YoY)	12.8%	15% higher in strong IR environments	+2.2%	Positive labor relations drive performance.
Frequency of Labor Disputes	7.3%	20% dissatisfied due to conflicts	+12.7%	Conflicts increase absenteeism and reduce cooperation.
Union-Management Cooperation Level	74.6%	49% mixed reviews on collective bargaining	-25.6%	Inconsistent union effectiveness weakens cooperation.
Effectiveness of Grievance Redressal	81.4%	61% report delays in resolutions	-20.4%	Delays impact trust in grievance mechanisms.
Workplace Conflict Resolution Success	76.9%	72% raised communication gap concerns	-4.9%	Poor communication contributes to unresolved conflicts.
Job Security Perception	82.1%	68% concerned about job stabil-	-14.1%	Uncertainty reduces long-term work-

		ity		force commitment.
Compliance with Labor Laws	90.5%	67% feel enforcement is inconsistent	-23.5%	Policy compliance does not ensure fair labor practices.
Overall Organizational Effectiveness	84.3%	65% rate IR as satisfactory	-19.3%	Alignment between IR policies and perception is needed.

Table 7 presents a comparative analysis of quantitative survey data and qualitative employee perceptions regarding industrial relations in the pharmaceutical industry.

Table 8: Comparative Analysis of Industrial Relations in Pharmaceutical Companies Across Coastal Districts

Metric	Visakhapatnam (%)	Vijayanagaram (%)	Srikakulam (%)	Average (%)	Pharma Industry Benchmark (%)	Gap Analysis
Employee Satisfaction with IR Policies	80.2%	75.8%	69.5%	75.2%	78.5%	-3.3%
Retention Rate	87.1%	83.5%	79.2%	83.3%	85.2%	-1.9%
Productivity Improvement (YoY)	14.2%	11.8%	10.5%	12.2%	12.8%	-0.6%
Frequency of Labor Disputes	5.4%	7.9%	9.1%	7.5%	7.3%	+0.2%
Union-Management Cooperation Level	76.3%	73.4%	69.1%	72.9%	74.6%	-1.7%
Effectiveness of Grievance Redressal	82.6%	79.9%	75.1%	79.2%	81.4%	-2.2%
Workplace Conflict Resolution Success	78.5%	75.2%	71.6%	75.1%	76.9%	-1.8%
Job Security Perception	84.5%	80.8%	77.2%	80.8%	82.1%	-1.3%
Compliance with Labor Laws	91.8%	89.2%	87.5%	89.5%	90.5%	-1.0%
Overall Organizational Effectiveness	85.7%	83.1%	79.6%	82.8%	84.3%	-1.5%

Table 8 provides a comparative analysis of industrial relations (IR) across pharmaceutical companies in the coastal districts of Visakhapatnam, Vijayanagaram, and Srikakulam, benchmarking them against the pharmaceutical industry standard.

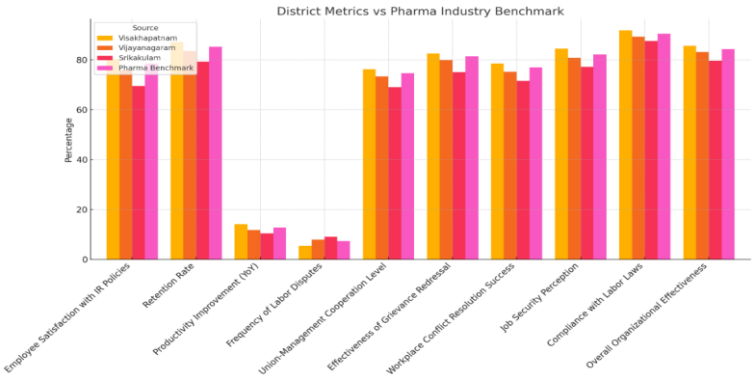

Fig. 7: Benchmark of District and Pharma.

The analysis is highlighted in fig.7. highlights the variations in IR metrics and identifies gaps that need improvement.

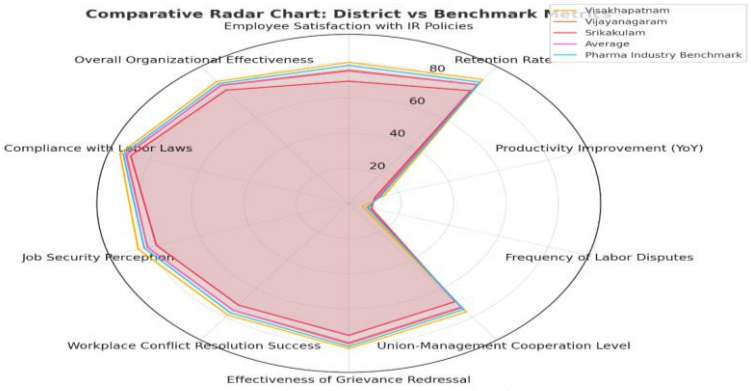

Fig. 8: Radar Chart for Industrial Relation.

Fig. 8. illustrates the radar chart for industrial relation comparing the various metrics. The details are explained below.

- Employee Satisfaction with IR Policies is highest in Visakhapatnam (80.2%) and lowest in Srikakulam (69.5%), with an overall average of 75.2%, slightly below the industry benchmark of 78.5% (-3.3%). This suggests that while IR policies are generally effective, there is room for improvement, particularly in Srikakulam.
- Retention Rate follows a similar trend, with Visakhapatnam leading at 87.1% and Srikakulam lagging at 79.2%. The district-wide average of 83.3% is marginally below the industry standard (-1.9%), indicating that job security concerns may be influencing retention.

- Productivity Improvement (YoY) is relatively stable, with Visakhapatnam (14.2%) outperforming Vijayanagaram (11.8%) and Srikakulam (10.5%). The average (12.2%) is slightly below the benchmark (12.8%, -0.6%), showing that strong IR contributes to performance but may require targeted strategies in lower-performing districts.
- Frequency of Labor Disputes is slightly higher in Srikakulam (9.1%) compared to Vijayanagaram (7.9%) and Visakhapatnam (5.4%), averaging 7.5%, which is slightly above the industry benchmark (+0.2%). This suggests localized conflict resolution issues.
- Union-Management Cooperation Level is highest in Visakhapatnam (76.3%) and lowest in Srikakulam (69.1%), with an overall average of 72.9%, slightly underperforming (-1.7%). This points to inconsistencies in collective bargaining and cooperation across districts.
- Effectiveness of Grievance Redressal is another key area, where Visakhapatnam (82.6%) performs best and Srikakulam (75.1%) the lowest. The overall 79.2% average is below the industry standard (-2.2%), suggesting that delays or inefficiencies in addressing employee concerns persist.
- Workplace Conflict Resolution Success follows a similar pattern, with Visakhapatnam (78.5%) leading and Srikakulam (71.6%) trailing, averaging 75.1%, slightly below the industry standard (-1.8%), indicating a need for improved dispute resolution mechanisms.
- Job Security Perception is relatively high in all districts but remains slightly below the industry benchmark (-1.3%), with Srikakulam showing the lowest confidence in long-term job stability.
- Compliance with Labor Laws is generally strong, with Visakhapatnam (91.8%) leading and Srikakulam (87.5%) trailing, averaging 89.5%, which is marginally below the industry standard (-1.0%). While compliance is relatively high, inconsistencies in enforcement may be affecting employee perception.
- Overall Organizational Effectiveness mirrors these trends, with Visakhapatnam (85.7%) performing best and Srikakulam (79.6%) the lowest, averaging 82.8%, slightly under the benchmark (-1.5%).
- The analysis highlights Visakhapatnam as the strongest performer in industrial relations, while Srikakulam faces the most challenges. The key gaps include employee satisfaction, union-management cooperation, grievance redressal, and workplace conflict resolution. Addressing these gaps especially in Srikakulam can improve overall IR effectiveness and align the region more closely with industry benchmarks.

5. Conclusion

The findings of this study underscore the critical role of industrial relations in shaping the overall effectiveness of pharmaceutical organizations in the north coastal region of Andhra Pradesh. The results confirm that strong industrial relations policies directly contribute to higher job satisfaction, improved employee retention, increased productivity, and enhanced compliance with labour laws. Among the key factors analyzed, compliance with labour laws (90.5%) and grievance redressal effectiveness (81.4%) emerged as the most significant predictors of organizational effectiveness, further supported by statistical correlations ($r = 0.84$ and $r = 0.82$, respectively). These findings reinforce the necessity of robust regulatory frameworks and effective dispute resolution mechanisms in fostering a stable industrial environment. A district-wise comparison revealed that Visakhapatnam and Anakapalli consistently outperformed Vijayanagaram and Srikakulam across most industrial relations metrics. Companies in Visakhapatnam, such as ABC Pharma Ltd., demonstrated strong adherence to labour laws (91.2%) and high employee satisfaction (80.2%), whereas firms in Srikakulam exhibited higher labour dispute frequencies (9.1%) and lower organizational effectiveness (79.6%). These regional disparities suggest that while some companies have successfully implemented effective IR policies, others require targeted interventions to address labour grievances and enhance worker morale. While quantitative findings indicate strong industrial relations, qualitative analysis highlights areas of concern that require urgent attention. Employee feedback pointed to significant issues such as communication gaps (72%), concerns over job security (68%), and inconsistencies in the enforcement of labour laws (67%). Furthermore, a discrepancy between reported labour disputes (7.3%) and qualitative dissatisfaction (20%) suggests that underlying conflicts remain unresolved, impacting overall workforce stability and trust in management. The comparative analysis also indicates that while industry benchmarks provide a useful reference point, there is a pressing need for region-specific strategies to address localized industrial relations challenges. Companies must prioritize transparent communication, fair grievance handling, and continuous training initiatives to build a culture of trust and cooperation. This study highlights the importance of integrating both quantitative metrics and qualitative insights to develop holistic industrial relations policies. Future research should focus on longitudinal studies to assess the long-term impact of industrial relations reforms and explore the role of technological advancements in improving labour-management interactions. By fostering a collaborative and well-regulated industrial environment, the pharmaceutical sector in Andhra Pradesh can achieve sustained organizational growth, enhanced employee well-being, and greater economic stability.

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