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Statistical Analysis of Strategic Leadership Qualities in the Pharmaceutical Sector of India's National Capital Region

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Abstract: In recent years, leadership quality has played a vital role for professional success of corporate leaders and their organization. However, it is affected by various dominant variables. This information paves the way for the present study. This research paper presents a comprehensive analysis of demographic characteristics, perceptions of leadership styles, innovative leadership practices and employee engagement within pharmaceutical industries located in India's National Capital Region (NCR). Considering their professional tenure and strategic decision-making ability, 383 participants were examined for this work. This research paper analyses different types of innovative leadership styles and highlights their shortcomings and strengths. In addition, the study also assesses the effects of innovative leadership practices. The study finds that while moderate positivity is appropriate, it also has many inconsistencies, especially in relation to the Indian pharmaceutical sector. The work shows moderate positivity in perceptions related to roles, recognition, and decision-making, with average ratings around 3.20. Significant variations in how valued and involved different groups feel indicate discrepancies across departments, emphasizing the need for initiatives that enhance inclusivity and uniform recognition to boost engagement and satisfaction.

Introduction

The pharmaceutical industry in India's National Capital Region (NCR) is a vital hub of innovation, production and distribution of healthcare solutions to individuals. The region, comprising cities such as Delhi, Noida and Gurugram, is important due to its strategic location, strong infrastructure and access to a skilled workforce. The growth of the pharmaceutical sector is highly dependent on the leadership capabilities of the individuals working in it. Hence, it is important to understand the dynamics of leadership styles, employee engagement and innovative practices in this sector as these are crucial for maintaining growth and competitiveness in a rapidly evolving global market (Singh et al., 2023; Bass, 1990; Malik et al., 2021; Ray & Ray, 2021). Leadership within the pharmaceutical industry is particularly challenging as it requires public health, regulatory scrutiny and continuous technological and scientific advancement. Transformational leaders are those who can inspire and motivate their juniors and workers with their actions and ideas. They can be considered as innovation catalysts as they lead the manufacturing firm to unprecedented discoveries and solutions (Gupta et al., 2023; Bass & Riggio, 2006). The concept of leadership is also important in this field because it directly affects a company's ability to efficiently develop new drugs and treatments and remain competitive in the market (Klarin et al., 2021; Shenoy & Shailashri, 2022). Indeed, the ability to innovate within the pharmaceutical industry is driven by an organizational culture that not only requires substantial investment in research and development but also supports risk taking and encourages creative solutions to any immediate problems (Chen, 2005; Harter et al., 2002;

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Shivdas & Ray, 2021). Several studies have found that organizations that foster this culture have higher productivity and financial returns than many of their competitors and also have a better working environment (Kumar and Deshmukh, 2013; Samimi et al., 2022; Lockwood, 2007; Lei et al., 2020; Alblooshi et al., 2021; Handoyo et al., 2023). Due to this all employees perform better and there is harmony among them. Considering these issues, in this research paper, authors try to analyse the strategic leadership qualities in the pharmaceutical sector of India's national capital region (NCR).

Methodology

In this research, the authors have used a mixed-method approach to explore leadership and innovation in the pharmaceutical sector of the National Capital Region of India. First, a questionnaire was created, then its reliability and validity were verified. It was then distributed among 520 people, out of which 383 participant responses were selected for analysis. The questionnaire measured opinions on leadership and innovation using the Likert scale. On the other hand, challenges and practices have been analyzed through interviews. Descriptive statistics and tests such as ANOVA and t-test have been used for analysis.

Results and Discussion

Demographic analysis

This study collected data from 383 participants from different pharmaceutical industries in India's National Capital Region (NCR).

Figure 1 shows that the mean age of respondents is 41.62 years, with a standard deviation of 10.22 years. The age ranges from 24 to 65 years, with the majority of middle-aged adults from 35-48 years.

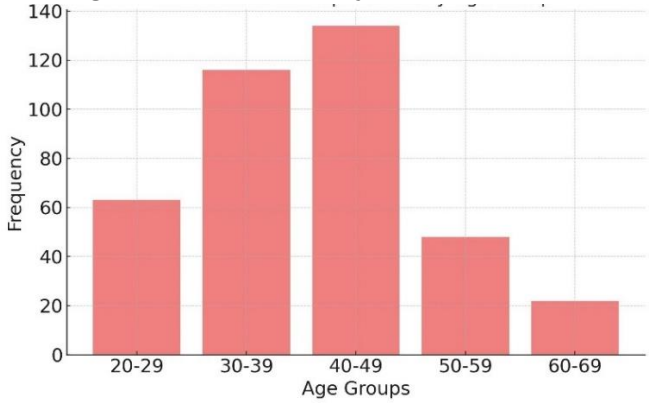

Figure 1. Distribution of Respondents by Age Group.

From Figure 2, it is clear that the high level of education among the participants underscores their capability to engage in complex and specialized tasks or discussions pertinent to the study.

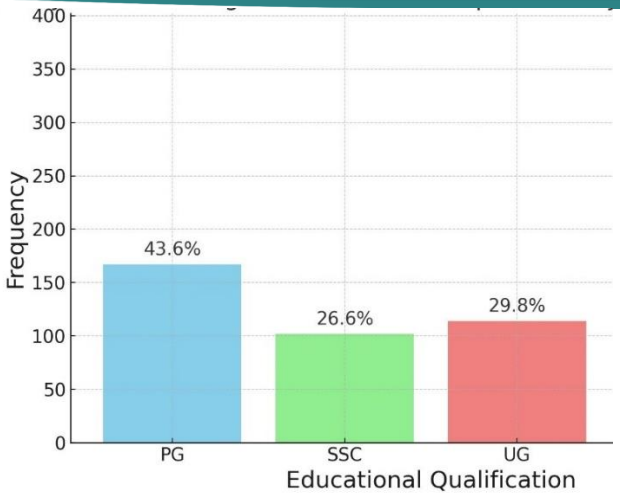

Figure 2. Frequency Distribution of Respondents by Educational Qualification.

Figure 3 shows a broad spectrum of professional tenure, with an average of 16.74 years in their current positions and a standard deviation of 9.27 years. The majority have substantial experience, with a median of 16 years, highlighting a workforce that is well-versed and seasoned in their respective fields.

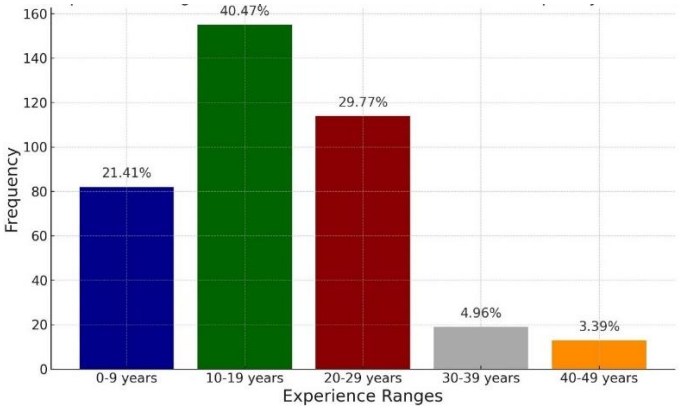

Figure 3. Experience Range of Respondents in Current Position Grouped by Decades.

This demographic overview emphasizes the diversity and depth of experience and education among the participants, making them particularly suited for the in-depth analyses required by the study's objectives. The data gathered from these pharmaceutical industries adds significant value, considering the specialized nature of their work and the critical role of the NCR region as a hub for such industries.

Perception of Leadership Styles

Table 1 offers a detailed examination of various leadership dynamics within a sample of 383 participants. The data captures essential aspects such as the presence and influence of transformational and transactional leadership styles, along with the responses of immediate

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Table 1. Descriptive Statistics of Leadership Styles and Organizational Response Attributes.

Most Dominant Leadership Style within Organizations	Response of Immediate Supervisors to Authoritarian Leaders	Prevalence of Transformational Leadership within Organizations	Response of Immediate Supervisors to Eventual Leadership Tip	Prevalence of Transformational Leadership within Organizations	Response of Immediate Supervisors to Transactional Leadership	Presence of Transactional Leadership	Response of Immediate Supervisors to Transformational Leadership	Presence of Transformational Leadership	Statistics
383	383	383	383	383	383	383	383	383	N
3.36a	3.19a	3.31a	3.19a	3.38	3.09a	2.98	2.80a	3.32	Mean
4	4	4	3	3	4	3	2	3	Median
1.248	0.975	0.976	1.158	1.276	1.284	1.272	1.429	1.531	Mode
-0.127	-0.042	-0.397	0.05	-1.41	-0.048	1.02	1.51	-1.25	Variance
-0.954	-0.941	-0.907	-1.439	-0.849	-1.212	-0.755	-1.277	-1.041	Skewness
0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	Kurtosis
1276	1218	1232	1221	1284	1173	1157	1101	1265	Std. Error of Skewness
0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	Std. Error of Kurtosis
1276	1218	1232	1221	1284	1173	1157	1101	1265	Sum

The "a" next to some median values indicates they are calculated from grouped data

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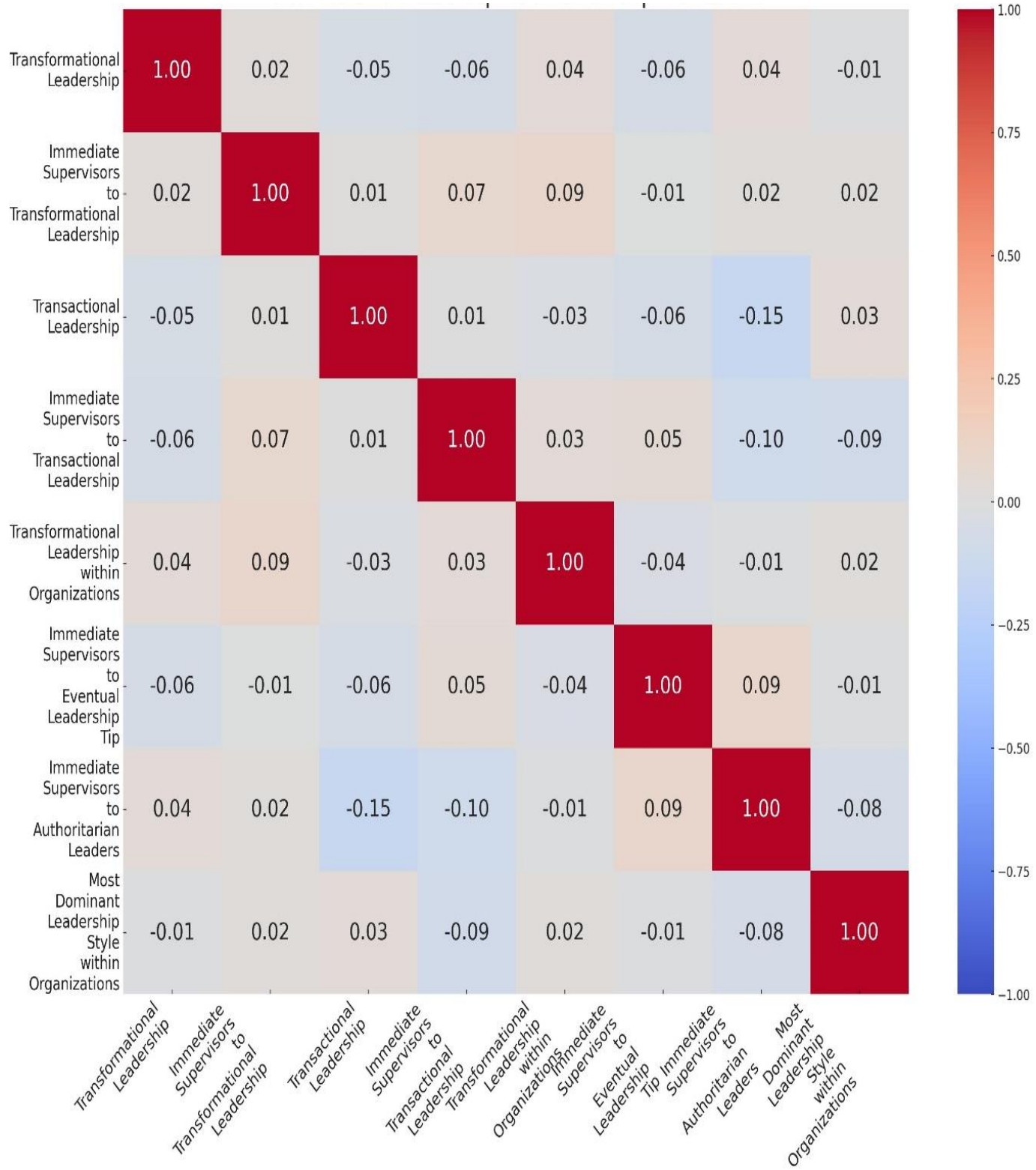

Figure 4. Correlation Heatmap of Leadership Variables.

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Table 2. ANOVA Results for Leadership Styles.

Variable	Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Presence of Transformational Leadership	Between Groups	62.340	4	15.585	11.274	<.001
	Within Groups	522.527	378	1.382		
	Total	584.867	382			
Response of Immediate Supervisors to Transformational Leadership	Between Groups	22.395	4	5.599	4.042	.003
	Within Groups	523.589	378	1.385		
	Total	545.984	382			
Presence of Transactional Leadership	Between Groups	12.661	4	3.165	2.529	.040
	Within Groups	473.172	378	1.252		
	Total	485.833	382			
Response of Immediate Supervisors to Transactional Leadership	Between Groups	20.552	4	5.138	4.133	.003
	Within Groups	469.944	378	1.243		
	Total	490.496	382			
Prevalent Servant Leadership	Between Groups	4.577	4	1.144	.896	.466
	Within Groups	481.569	377	1.277		
	Total	486.147	381			
Response of Immediate Supervisors to Servant Leadership	Between Groups	8.063	4	2.016	1.754	.137
	Within Groups	434.402	378	1.149		
	Total	442.465	382			
Prevalent Democratic Leadership	Between Groups	30.916	4	7.729	8.540	<.001
	Within Groups	342.097	378	.905		
	Total	373.013	382			
Response of Immediate Supervisors to Authoritarian Leaders	Between Groups	24.070	4	6.018	6.527	<.001
	Within Groups	348.499	378	.922		
	Total	372.569	382			

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Table 3. Independent Samples T-Test Results for Leadership Styles and Immediate Supervisor Responses.

Variable	Levene's Test for Equality of Variances		T-test for Equality of Means					95% Confidence Interval of the Difference	
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Presence of Transformational Leadership	1.428	.235	-1.187	17.913	.243	-.271	.385	-1.091	0.321
Response of Immediate Supervisors to Transformational Leadership	1.690	.196	-.545	103	.587	-.181	.332	-.841	0.478
Presence of Transactional Leadership within Organization	.093	.761	1.354	16.550	.197	.194	.516	-.290	1.323
Response of Immediate Supervisors to Transactional Leadership	6.782	.011	.313	103	.377	.755	.088	-.469	6.415
Prevalent Servant Leadership within Organization	.007	.932	.269	103	.394	.788	.088	-.560	0.736
Response of Immediate Supervisors to Servant Leadership	.484	.488	-.038	17.933	.390	.780	.088	-.588	0.566
Prevalent Democratic Leadership within Organization	.629	.429	-.295	17.036	.382	.769	.088	-.680	0.517
Response of Immediate Supervisors to Authoritarian Leaders	.067	.796	.925	103	.178	.357	.236	-.270	0.743

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supervisors to these styles. The mean scores range from 2.80 to 3.38, reflecting moderate to strong presence and responses to different leadership types. Transformational leadership within organizations notably shows a slightly higher mean, suggesting its prevalence and potential positive reception. Variance and skewness values indicate some dispersion and asymmetry in the responses, hinting at diverse perceptions of leadership effectiveness among participants. Additionally, the consistent kurtosis values suggest a normal distribution of responses across the attributes, providing a robust basis for further analysis of how these leadership styles impact organizational behavior and employee attitudes.

Table 2 provides a statistical analysis of how different leadership styles and the responses of immediate supervisors to these styles vary across a dataset of 383 participants. The table highlights significant differences in the presence and perception of transformational, transactional, servant, and democratic leadership styles within the organization.

For transformational leadership, there is a notable variation between groups ($F=11.274$, $p<.001$), suggesting strong differences in how this style is manifested or perceived across different groups within the sample. Similarly, the response of supervisors to transformational leadership also shows significant differences ($F=4.042$, $p=.003$), indicating varied perceptions of this leadership response among the groups.

Transactional leadership shows a lower, yet significant variation ($F=2.529$, $p=.040$), pointing to some degree of difference in its presence across the groups. The response to transactional leadership mirrors this with a similar level of significance ($F=4.133$, $p=.003$).

Conversely, servant leadership does not exhibit significant differences between groups ($F=.896$, $p=.466$), suggesting a more uniform perception or presence across the sample. However, the response to servant leadership shows no significant variation ($F=1.754$, $p=.137$), reinforcing the notion of uniformity in its perception.

Democratic leadership displays a strong discrepancy between groups ($F=8.540$, $p<.001$), indicating distinct variations in how this leadership style is appreciated or implemented across different segments of the organization. Similarly, the response to authoritarian leaders is also significantly varied ($F=6.527$, $p<.001$), suggesting strong differences in how different groups receive this leadership style.

Figure 4 provides the correlation heatmap of leadership variables, which reveals significant correlations among leadership styles and supervisory responses. Transformational leadership strongly correlates positively with immediate supervisors' responses, suggesting its prevalence and impact within organizations.

Table 3 is designed to assess if there are significant differences in the perceptions of leadership styles and responses from immediate supervisors among distinct groups within a sample of 383 participants. This analysis uses Levene's Test for Equality of Variances to ensure valid comparisons across potentially diverse variance conditions and employs T-tests to determine the statistical significance of mean differences. The findings reveal no significant disparities in the perception of transformational and transactional leadership styles, suggesting a homogeneous view across the organization. Similarly, supervisors' responses to these leadership styles are consistent, indicating no significant differences. Notably, responses to transactional leadership show considerable variance at the upper confidence limit, highlighting some extreme perceptions which could influence general conclusions.

Table 4 shows that The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy is 0.540. Meanwhile, Bartlett's Test of Sphericity, which assesses whether the correlation matrix is an identity matrix implying that variables are unrelated, shows a significant result with an Approximate Chi-Square of 183.040 and a significance level of less than 0.001. This significant result confirms that the observed variables are intercorrelated and suitable for structure detection through factor analysis. Therefore, the analysis supports proceeding with factor analysis as the data does not appear to be overly dispersed and demonstrates sufficient commonalities for meaningful factor extraction.

Table 4. KMO and Bartlett's Test of Sphericity Results.

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.540
Bartlett's Test of Sphericity	
Approx. Chi-Square	183.040
df	28
Sig.	< .001

Innovative Leadership Practices

The analysis of innovative leadership practices within an organization, as reflected through various statistical evaluations, offers significant insights into how innovation is perceived and implemented across different levels of management. The Descriptive Statistics (Table 5) reveal a median and mode that suggest a neutral to positive perception of innovation practices, with the distribution being almost symmetrical as indicated by the

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Table 5. Descriptive Statistics of Innovative Leadership Practices and Management Innovation Behaviors.

Statistics	Prevalent Innovative Leadership Practices within Organization	Level of Management Exhibiting Most Innovative Leadership Practices
N (Valid)	383	383
Median	3.00	3.00
Mode	4	2
Variance	1.370	1.332
Skewness	-0.029	0.067
Standard Error of Skewness	0.125	0.125
Kurtosis	-1.163	-0.953
Standard Error of Kurtosis	0.249	0.249

skewness near zero. This is complemented by a slight flattening of the distribution curve, as shown by the negative kurtosis values. Figure 5 visually depicts the correlation heatmap of innovative leadership practices. Furthermore, the ANOVA results (Table 6) highlight significant differences between groups ($p = .014$), suggesting variability in how innovation is enacted or perceived across different organizational divisions or groups. This variability points to potential areas where targeted interventions could harmonize or enhance innovative practices.

Additionally, the Independent Samples T-Test (Table 7) indicates no significant differences in the perception of innovative practices between the compared groups ($p > .2$ in both cases), suggesting a generally consistent recognition of innovative leadership across the sample despite the variability suggested by ANOVA. This consistency might reflect an organizational culture that broadly supports or recognizes innovation, but with

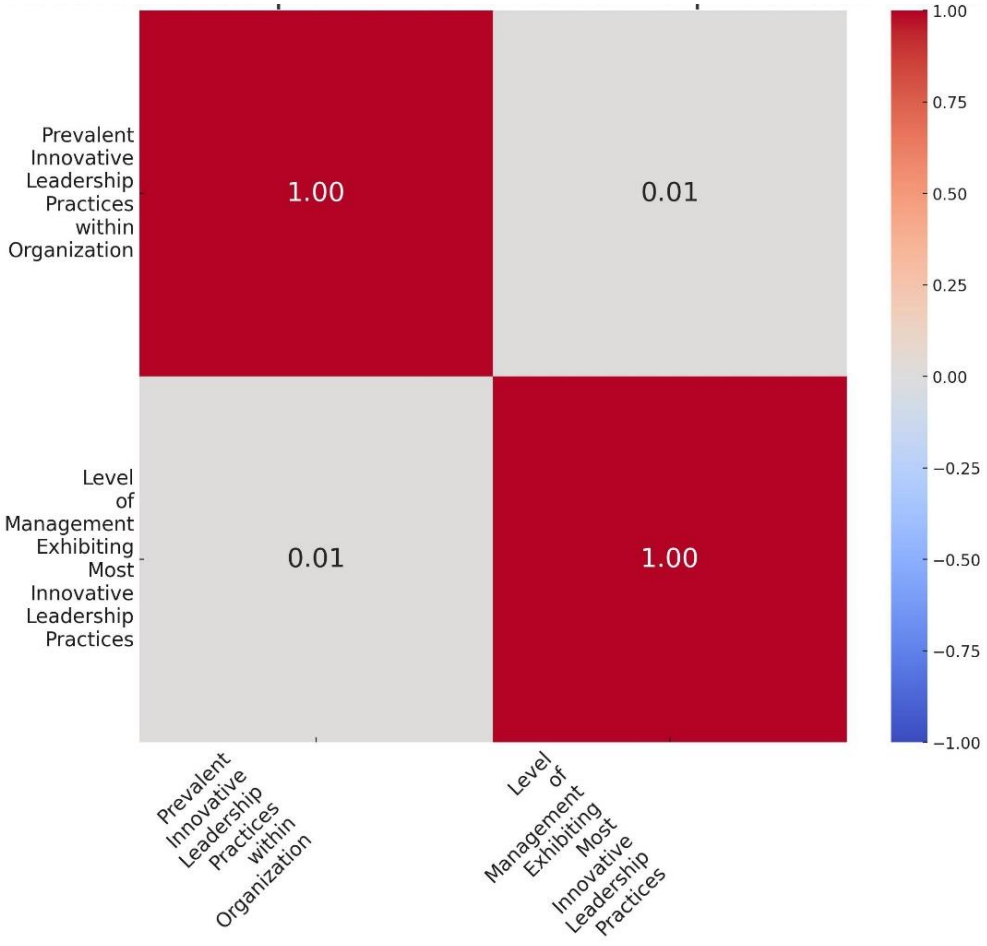

Figure 5. Correlation Heatmap of Innovative Leadership Practices.

varying degrees of enthusiasm or effectiveness across different groups or departments. These findings underscore the need for ongoing evaluation and targeted development strategies to uniformly enhance the embedding of innovative leadership practices across the organization, ensuring all segments are equally capable of contributing to and benefiting from innovative processes.

Table 6. ANOVA Results for Prevalent Innovative Leadership Practices within an Organization.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.961	4	4.240	3.164	.014
Within Groups	506.511	378	1.340		
Total	523.473	382			

Table 7. Independent Samples T-Test Results for Prevalent Innovative Leadership Practices within an Organization.

Test	Equal Variances Assumed	Equal Variances Not Assumed
Levene's Test for Equality of Variances		
F	0.075	
Sig.	.785	
t-test for Equality of Means		
t	0.755	0.837
df	137	45.253
Sig. (Two-Sided)	.226	.204
Mean Difference	0.451	0.407
Std. Error Difference	0.195	0.195
95% Confidence Interval of the Difference		
Lower	-0.316	-0.275
Upper	0.707	0.666

Employee Engagement and Empowerment

The analysis of employee perceptions regarding their roles, recognition, decision-making involvement and organizational promotion efforts provides an in-depth look at organizational dynamics. Descriptive statistics, provided in Table 8 reveal that the average ratings for these aspects hover around 3.20, indicating a moderately positive sentiment among employees. This sentiment is further reinforced by the mode of 4 across all categories, suggesting that the most frequent response is positive, though skewness and kurtosis values indicate some asymmetry and flatness in the distributions, respectively. The ANOVA results, detailed in Table 9, expose significant variability in how opinions and ideas are valued ($F=6.124$, $p<.001$) and in the involvement in decision-making processes ($F=3.786$, $p=.005$), highlighting areas where perceptions differ significantly among groups within the organization. This suggests that while some departments or teams may feel highly valued and involved, others might not share the same experience. In contrast, perceptions of insecurity in roles and recognition for contributions show no significant differences among groups, indicating a more uniform sentiment across these aspects.

Independent Samples T-Tests, shown in Table 10, corroborate these findings, showing no significant differences in mean perceptions between the compared groups. This suggests a general consistency in how policies and practices are perceived, albeit with some exceptions, as noted in the ANOVA results. The lack of significant differences in the t-tests for feelings of insecurity and feedback points to a broadly consistent application of these organizational aspects. Lastly, the KMO and Bartlett's Test, summarized in Table 11, indicate a moderate adequacy for sampling in factor analysis concerning organizational efforts in promoting employee engagement, with a KMO value of 0.568 and a significant Bartlett's test, suggesting that the dataset is suitable for further factor analysis to explore underlying patterns or constructs. Fig. 6 shows the correlation heatmap of employee perceptions variables.

Organizational Culture and Innovation

As presented across multiple tables, the analysis of organizational culture and its influence on innovation offers a comprehensive look at how employees perceive their work environment and its support for innovative practices. In Table 12, the descriptive statistics reflect generally positive perceptions of the organization's culture, with means close to or above 3.0 across all measures, suggesting that employees generally feel encouraged to think innovatively and that the culture aligns well with stated organizational values. The mode consistently at 4 indicates a prevalent positive sentiment.

Table 13's ANOVA results further elucidate these perceptions. While the significance levels for the encouragement of innovative thinking and alignment with stated values show no significant variance among groups ($p > .1$), indicating a general consensus in these areas, there is a notable exception regarding comfort in sharing new and unconventional ideas ($p = .010$). This result suggests a significant disparity in how safe employees feel about proposing unconventional ideas, pointing to areas within the organization where the culture might not be as supportive or open as intended.

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Table 8. Descriptive Statistics of Employee Perceptions on Role Responsibilities, Recognition, Decision-Making Involvement, and Organizational Promotion.

Statistics	Feeling Insecure in Role and Responsibilities	Feedback and Recognition for Work Contributions	Opinions and Ideas are Valued	Involvement in Decision-Making Processes	Organizational Efforts in Promoting Employees
N (Valid)	383	383	383	383	383
Missing	134	134	134	134	134
Mean	3.13	3.30	3.15	3.22	3.19
Median	3.00	3.00	3.00	3.00	3.00
Mode	4	4	4	4	4
Variance	1.209	1.263	1.298	1.086	1.162
Skewness	-0.013	-0.122	-0.012	-0.139	-0.076
Standard Error of Skewness	0.125	0.125	0.125	0.125	0.125
Kurtosis	-1.112	-0.910	-1.186	-0.990	-1.057
Standard Error of Kurtosis	0.249	0.249	0.249	0.249	0.249
Sum	1197	1264	1205	1235	1223

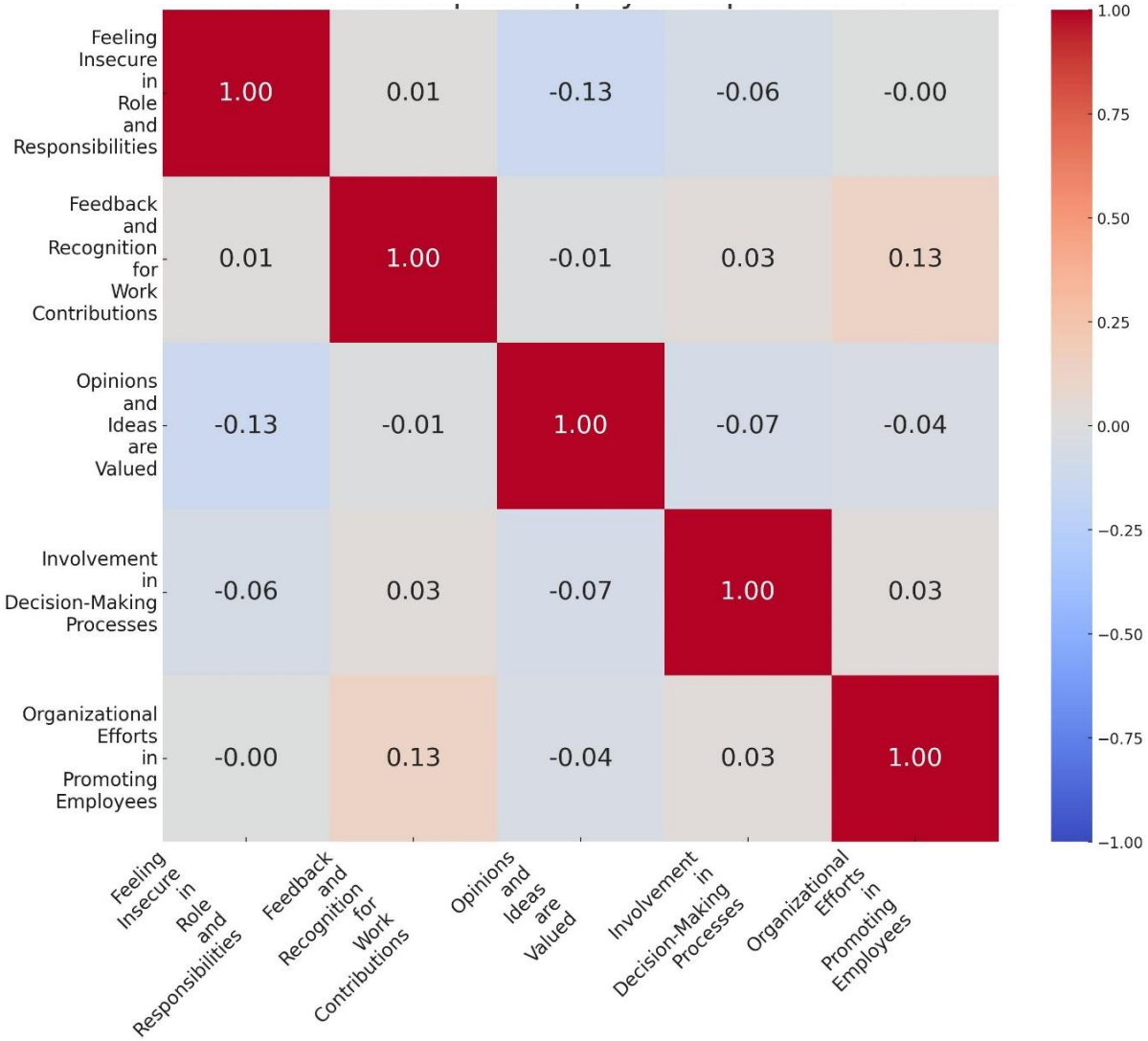

Figure 6. Correlation Heatmap of Employee Perceptions Variables.

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Table 9. ANOVA Results for Employee Perceptions on Role Responsibilities, Recognition, and Decision-Making Involvement.

Variable	Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Feeling Insecure in Role and Responsibilities	Between Groups	9.575	4	2.394	2.000	.094
	Within Groups	452.409	378	1.197		
	Total	461.984	382			
Feedback and Recognition for Work Contributions	Between Groups	4.243	4	1.061	.839	.501
	Within Groups	478.227	378	1.265		
	Total	482.470	382			
Opinions and Ideas are Valued	Between Groups	30.174	4	7.544	6.124	<.001
	Within Groups	465.638	378	1.232		
	Total	495.812	382			
Involvement in Decision-Making Processes	Between Groups	15.975	4	3.994	3.786	.005
	Within Groups	398.714	378	1.055		
	Total	414.689	382			

Table 10. Independent Samples T-Test Results for Employee Perceptions on Role Responsibilities, Recognition, and Decision-Making Involvement.

Variable	Equal Variances Assumed			Equal Variances Not Assumed		
	t	df	Sig.	t	df	Sig.
Feeling Insecure in Role and Responsibilities						
Levene's Test for Equality of Variances	F = 2.842	Sig. = .094				
t-test for Equality of Means	t = .025	126	.980	t = .031	17.171	.488
Mean Difference	.980			.975		
Std. Error Difference	.009			.277		
95% Confidence Interval of the Difference	Lower = -.678, Upper = .695			Lower = -.576, Upper = .593		
Feedback and Recognition for Work Contributions						
Levene's Test for Equality of Variances	F = 1.637	Sig. = .203				
t-test for Equality of Means	t = 1.362	126	.088	t = 1.516	15.769	.075
Mean Difference	.176			.149		
Std. Error Difference	.456			.456		
95% Confidence Interval of the Difference	Lower = -.207, Upper = 1.119			Lower = -.182, Upper = 1.095		
Opinions and Ideas are Valued						
Levene's Test for Equality of Variances	F = 1.540	Sig. = .217				
t-test for Equality of Means	t = 1.237	126	.109	t = 1.373	15.746	.094
Mean Difference	.218			.189		
Std. Error Difference	.421			.421		
95% Confidence Interval of the Difference	Lower = -.252, Upper = 1.094			Lower = -.230, Upper = 1.071		
Involvement in Decision-Making Processes						
Levene's Test for Equality of Variances	F = 1.821	Sig. = .180				
t-test for Equality of Means	t = .201	126	.420	t = .173	13.912	.433
Mean Difference	.841			.865		
Std. Error Difference	.061			.353		
95% Confidence Interval of the Difference	Lower = -.538, Upper = .659			Lower = -.696, Upper = .817		

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Independent t-tests in Table 14 underscore these findings, particularly the lack of significant differences in the perceptions of organizational encouragement for innovation and alignment with values, reinforcing the uniformity in employee perceptions. However, the minor significance observed in the alignment with organizational values suggests slight discrepancies among employee groups that merit attention. Finally, the results from the KMO and Bartlett's Test in Table 15, indicating a measure of sampling adequacy at 0.539, suggest that while factor analysis is feasible, the strength of the relationships among variables is moderate. This implies a need for cautious interpretation of factor analysis results due to potential limitations in the dataset's ability to identify underlying factors distinctly. The correlation heatmap of organizational culture and employee perception metrics is shown in Figure 7.

Table 11. KMO and Bartlett's Test of Sphericity Results for the Study on Organizational Efforts in Promoting Employee Engagement.

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.568
Bartlett's Test of Sphericity	
Approx. Chi-Square	22.549
df	6
Sig.	<.001

Organizational Culture and Innovation

As presented across multiple tables, the analysis of organizational culture and its influence on innovation offers a comprehensive look at how employees perceive their work environment and its support for innovative practices. In Table 12, the descriptive statistics reflect generally positive perceptions of the organization's culture, with means close to or above 3.0 across all measures, suggesting that employees generally feel encouraged to think innovatively and that the culture aligns well with stated organizational values. The mode consistently at 4 indicates a prevalent positive sentiment.

Table 13's ANOVA results further elucidate these perceptions. While the significance levels for the encouragement of innovative thinking and alignment with stated values show no significant variance among groups ($p > .1$), indicating a general consensus in these areas, there is a notable exception regarding comfort in sharing new and unconventional ideas ($p = .010$). This result suggests a significant disparity in how safe employees feel about proposing unconventional ideas, pointing to areas within the organization where the culture might not be as supportive or open as intended.

Independent t-tests in Table 14 underscore these findings, particularly the lack of significant differences in the perceptions of organizational encouragement for innovation and alignment with values, reinforcing the uniformity in employee perceptions. However, the minor significance observed in the alignment with organizational values suggests slight discrepancies among employee groups that merit attention. Finally, the results from the KMO and Bartlett's Test in Table 15, indicating a measure of sampling adequacy at 0.539, suggest that while factor analysis is feasible, the strength of the relationships among variables is moderate. This implies a need for cautious interpretation of factor analysis results due to potential limitations in the dataset's ability to identify underlying factors distinctly. The correlation heatmap of organizational culture and employee perception metrics is shown in Figure 7.

Organizational Performance Outcomes

The analysis of organizational performance and employee engagement metrics, detailed in Tables 16 through 18, provides insightful views into how employees perceive various aspects of organizational function and strategic alignment over recent years. Table 16 outlines descriptive statistics that reveal a generally positive perception across different performance metrics, with mean scores hovering around 3.2, indicative of a moderate to positive evaluation by employees. The mode consistently reported as 4 across all metrics further underscores a frequent positive response. However, the negative skewness, especially notable in overall performance and changes in performance metrics, suggests a tendency towards higher ratings, albeit with a spread that also includes lower outlier responses. In Table 17, the ANOVA results elucidate how these perceptions vary among different employee groups. While the overall performance of the organization in the past years and the changes in performance metrics and key performance indicators (KPIs) do not show significant variance among groups ($p > .2$), the alignment of organizational performance with strategic goals and objectives does ($F = 3.833$, $p = .005$). This significant finding suggests that perceptions of strategic alignment are disparate, potentially indicating areas within the organization where strategic objectives are not clearly met or understood. Table 18 presents the results from the KMO and Bartlett's Test of Sphericity for the conduct of employee engagement surveys, showing a KMO measure of 0.559. This suggests that while the sampling adequacy for factor analysis is borderline acceptable, the relationships among variables are not particularly strong, as evidenced by a non-significant Bartlett's test ($p > .2$). This indicates that

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Table 12. Descriptive Statistics of Organizational Culture and Employee Perception Metrics.

Statistics	Organizational Encouragement of Innovative Thinking and Practices	Organizational Culture Aligns with Stated Values and Mission	Comfortable Sharing New and Unconventional Ideas	Organizations Support for Innovative Initiatives and Projects
N (Valid)	383	383	383	383
Mean	3.28	3.20	3.14	3.11
Median	3.00	3.00	3.00	3.00
Mode	4	4	2	4
Standard Deviation	1.094	1.153	1.139	1.126
Variance	1.197	1.330	1.298	1.269
Skewness	-0.089	-0.013	0.015	-0.009
Standard Error of Skewness	0.125	0.125	0.125	0.125
Kurtosis	-0.958	-1.083	-1.057	-1.045
Standard Error of Kurtosis	0.249	0.249	0.249	0.249
Sum	1256	1227	1202	1190

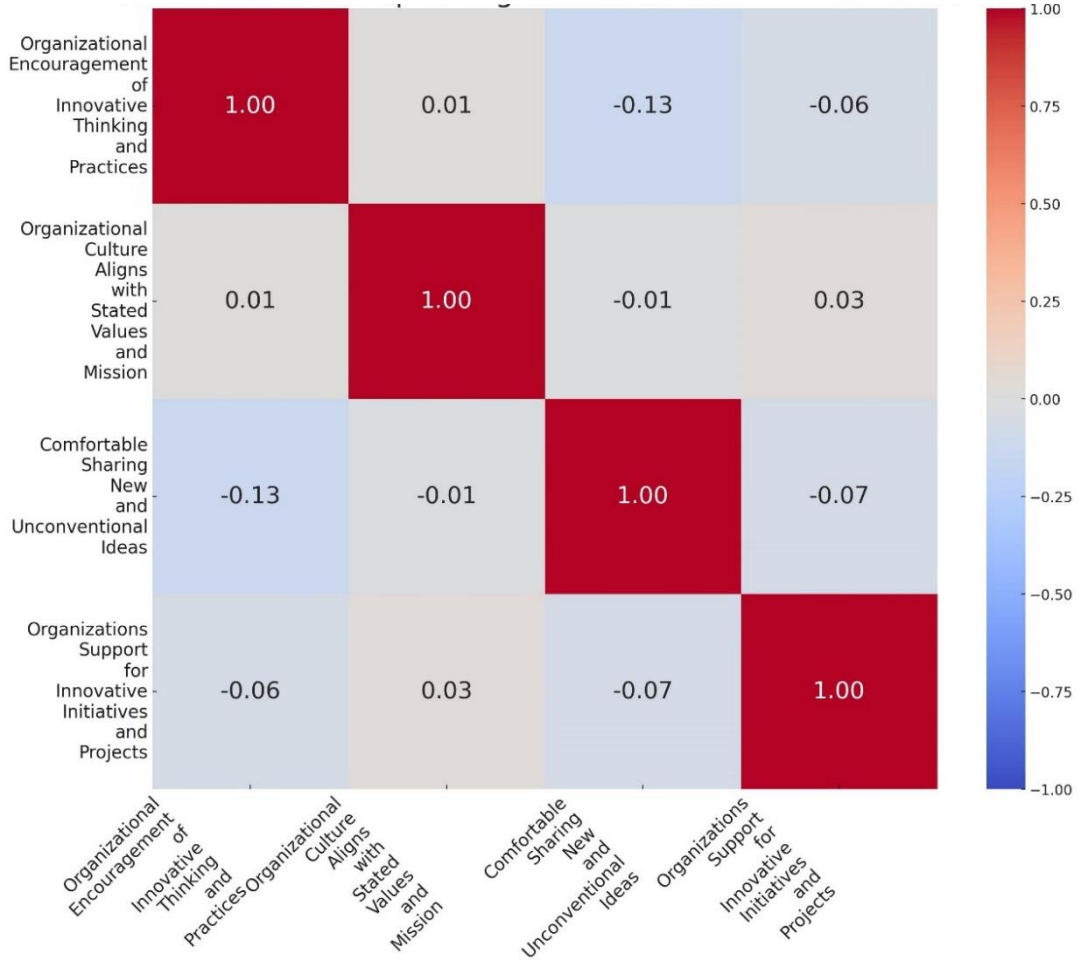

Figure 7. Correlation Heatmap of Organizational Culture and Employee Perception Metrics.

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Table 13. ANOVA Results for Employee Perceptions on Organizational Culture and Innovation.

Variable	Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Organizational Encouragement of Innovative Thinking and Practices	Between Groups	7.872	4	1.968	1.656	.160
	Within Groups	449.235	378	1.188		
	Total	457.107	382			
Organizational Culture Aligns with Stated Values and Mission	Between Groups	9.356	4	2.339	1.773	.134
	Within Groups	498.759	378	1.319		
	Total	508.115	382			
Comfortable to Share New and Unconventional Ideas	Between Groups	16.983	4	4.246	3.353	.010
	Within Groups	478.683	378	1.266		
	Total	495.666	382			

Table 14. Independent Samples T-Test Results for Evaluating Employee Perceptions on Organizational Encouragement and Culture.

Variable	Equal Variances Assumed		Equal Variances Not Assumed	
	t	df	t	df
Organizational Encouragement of Innovative Thinking and Practices				
Levene's Test for Equality of Variances	F = 1.346	Sig. = .248		
t-test for Equality of Means	t = .753	139	t = .844	30.524
Significance (Two-Sided)	.226		.203	
Mean Difference	.452		.405	
Std. Error Difference	.201		.201	
95% Confidence Interval of the Difference	Lower = -.327, Upper = .729		Lower = -.285, Upper = .688	
Organizational Culture Aligns with Stated Values and Mission				
Levene's Test for Equality of Variances	F = .307	Sig. = .581		
t-test for Equality of Means	t = 1.735	139	t = 1.738	27.513
Significance (Two-Sided)	.043		.047	
Mean Difference	.085		.093	
Std. Error Difference	.496		.496	
95% Confidence Interval of the Difference	Lower = -.069, Upper = 1.062		Lower = -.089, Upper = 1.082	
Comfortable to Share New and Unconventional Ideas				
Levene's Test for Equality of Variances	F = .327	Sig. = .569		
t-test for Equality of Means	t = -1.219	139	t = -1.399	31.331
Significance (Two-Sided)	.112		.086	
Mean Difference	-.327		-.327	
Std. Error Difference	.268		.234	
95% Confidence Interval of the Difference	Lower = -.858, Upper = .203		Lower = -.805, Upper = .150	

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Table 15. KMO and Bartlett's Test of Sphericity Results for Analysis of Organizational Support for Innovative Initiatives and Projects.

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.539
Bartlett's Test of Sphericity	
Approx. Chi-Square	4.630
df	3
Sig.	.201

Table 16. Descriptive Statistics for Organizational Performance and Employee Engagement Metrics.

Statistics	Overall Performance of Organization in the Past Years	Organizations Performance Aligning with Strategic Goals and Objectives	Change in Performance Metrics and Key Performance Indicators (KPIs)	Conduct of Employee Engagement Surveys to Measure and Improve
N (Valid)	383	383	382	382
Mean	3.23	3.21	3.28	3.22
Median	3.00	3.00	3.00	3.00
Mode	4	4	4	4
Standard Deviation	1.113	1.111	1.075	1.105
Variance	1.238	1.235	1.156	1.222
Skewness	-1.53	.000	-1.25	-.002
Standard Error of Skewness	.125	.125	.125	.125
Kurtosis	-0.935	-1.160	-1.003	-1.075
Standard Error of Kurtosis	.249	.249	.249	.249
Sum	1239	1230	1252	1230

Table 17. ANOVA Results for Employee Perceptions on Organizational Performance Metrics.

Variable	Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Overall Performance of Organization in the Past Years	Between Groups	6.570	4	1.643	1.328	.259
	Within Groups	466.226	377	1.237		
	Total	472.796	381			
Organizations Performance Aligns with Strategic Goals and Objectives	Between Groups	18.437	4	4.609	3.833	.005
	Within Groups	453.388	377	1.203		
	Total	471.825	381			
Change in Performance Metrics and Key Performance Indicators (KPIs)	Between Groups	6.315	4	1.579	1.371	.244
	Within Groups	434.271	377	1.152		
	Total	440.586	381			

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Table 18. KMO and Bartlett's Test of Sphericity Results for Analysis of Employee Engagement Survey Conduct.

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.559
Bartlett's Test of Sphericity	
Approx. Chi-Square	4.231
df	3
Sig.	.238

Table 19. Descriptive Statistics for the Importance of Innovative Leadership and Challenges to Innovation in the Organization.

Statistics	Importance of Innovative Leadership for Organizational Success	Challenges to Driving Innovation in the Organization
N (Valid)	382	382
Median	3.00	3.00
Mode	4	4
Standard Deviation	1.088	1.095
Variance	1.184	1.200
Skewness	-0.111	-0.011
Standard Error of Skewness	0.125	0.125
Kurtosis	-1.030	-0.929
Standard Error of Kurtosis	0.249	0.249
Sum	1216	1219

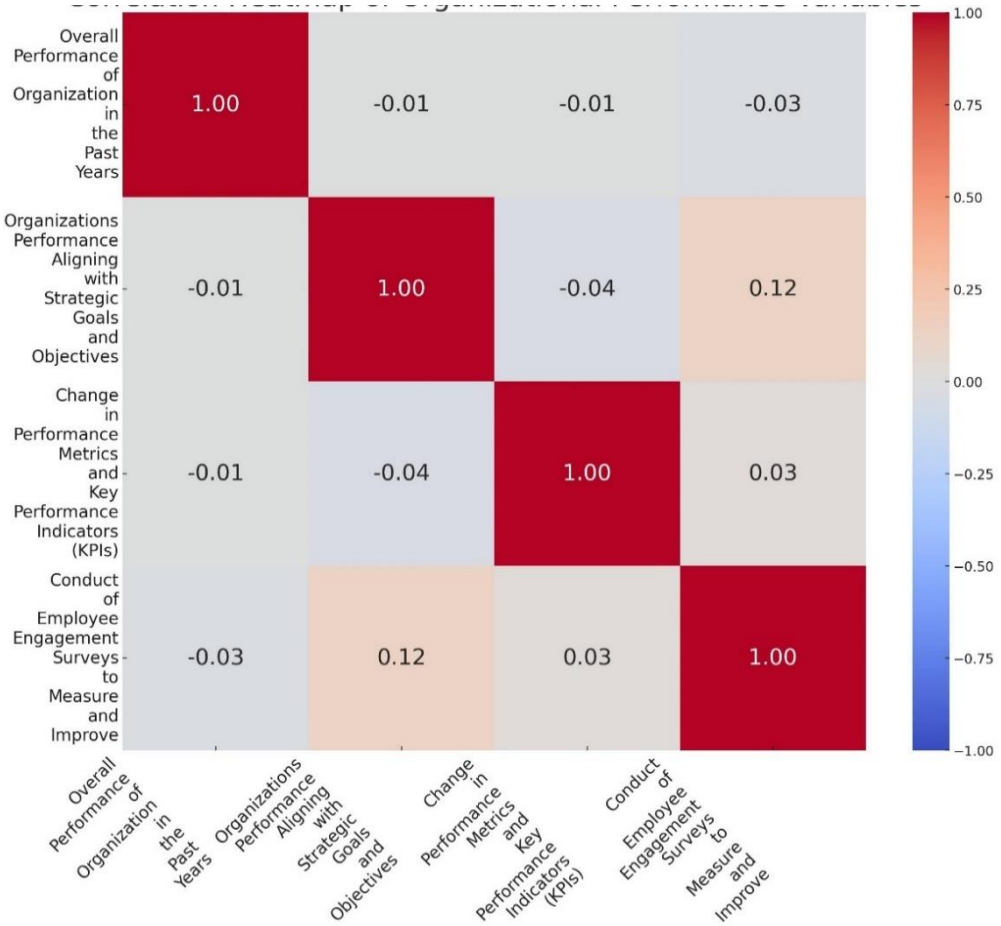

Figure 8. Correlation Heatmap of Organizational Performance and Employee Engagement Metrics.

Table 20. ANOVA Results for the Importance of Innovative Leadership for Organizational Success.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24.898	4	6.224	5.505	< .001
Within Groups	426.275	377	1.131		
Total	451.173	381			

Table 21. Descriptive Statistics for Organizational Commitment to Leadership Development and Related Metrics.

Statistics	Organizational Commitment to Leadership Development	Importance of Leadership Development for Organizational Longevity	Satisfaction with Attendance in Leadership Training Programs	Alignment of Leadership Development Initiatives with Organizational Goals
N (Valid)	382	382	382	382
Mean	3.23	3.20	3.22	3.20
Median	3.00	3.00	3.00	3.00
Mode	4	4	4	4
Standard Deviation	1.141	1.135	1.081	1.045
Variance	1.303	1.288	1.168	1.092
Skewness	-0.094	-0.007	-0.090	-0.014
Standard Error of Skewness	0.125	0.125	0.125	0.125
Kurtosis	-1.089	-1.045	-1.121	-1.074
Standard Error of Kurtosis	0.249	0.249	0.249	0.249
Sum	1235	1222	1229	1224

Table 22. ANOVA Results for Perceptions of Leadership Development Metrics within the Organization.

Variable	Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Organizational Commitment to Leadership Development	Between Groups	22.595	4	5.649	4.496	.001
	Within Groups	473.669	377	1.256		
	Total	496.264	381			
Importance of Leadership Development for Organizational Longevity	Between Groups	32.175	4	8.044	6.611	<.001
	Within Groups	458.705	377	1.217		
	Total	490.880	381			
Alignment of Leadership Development Initiatives with Organizational Goals	Between Groups	16.628	4	4.157	3.923	.004
	Within Groups	399.446	377	1.060		
	Total	416.073	381			

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Table 23. Independent Samples T-Test Results for Evaluating Perceptions on Leadership Development Metrics.

Variable	Equal Variances Assumed		Equal Variances Not Assumed	
	t	df	t	df
Organizational Commitment to Leadership Development				
Levene's Test for Equality of Variances	F = .233	Sig. = .630		
t-test for Equality of Means	t = 2.192	127	t = 2.319	12.236
Significance (Two-Sided)	.030		.019	
Mean Difference	.330		.382	
Std. Error Difference	.812		.350	
95% Confidence Interval of the Difference	Lower = .079, Upper = 1.545		Lower = .051, Upper = 1.573	
Importance of Leadership Development for Organizational Longevity				
Levene's Test for Equality of Variances	F = .073	Sig. = .788		
t-test for Equality of Means	t = .790	127	t = .814	12.095
Significance (Two-Sided)	.431		.421	
Mean Difference	.431		.431	
Std. Error Difference	.269		.269	
95% Confidence Interval of the Difference	Lower = -.405, Upper = .943		Lower = -.450, Upper = .988	
Alignment of Leadership Development Initiatives with Organizational Goals				
Levene's Test for Equality of Variances	F = .004	Sig. = .951		
t-test for Equality of Means	t = -.480	127	t = -.478	11.927
Significance (Two-Sided)	.632		.321	
Mean Difference	-.148		-.148	
Std. Error Difference	.308		.309	
95% Confidence Interval of the Difference	Lower = -.758, Upper = .462		Lower = -.822, Upper = .527	

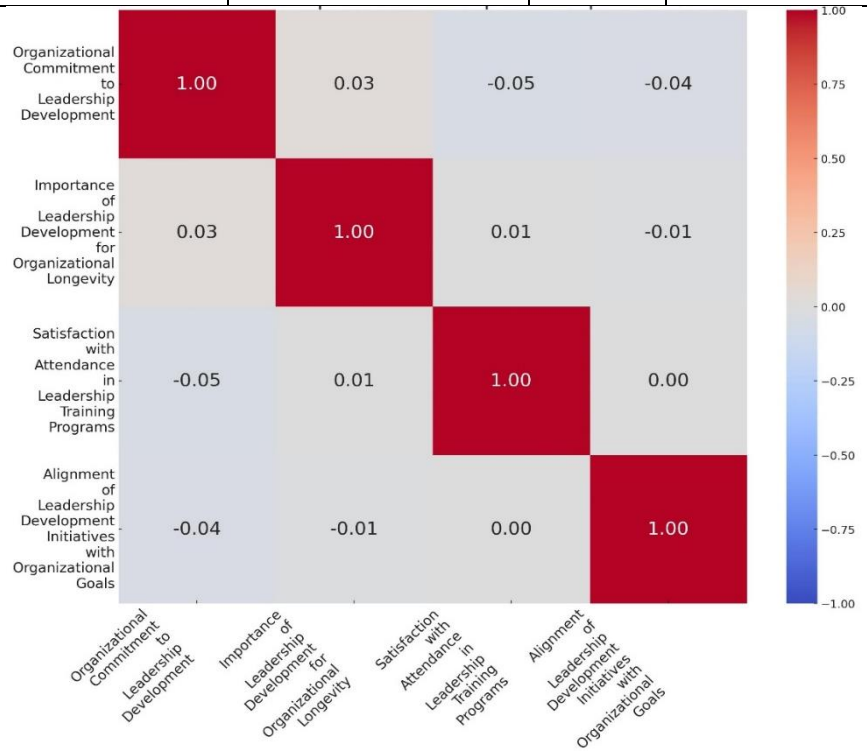

Figure 9. Correlation Heatmap of Perceptions of Leadership Development Metrics within the Organization.

the correlation matrix is not sufficiently different from an identity matrix, which might limit the effectiveness of factor analysis to categorize underlying factors influencing employee perceptions of engagement efforts distinctly. Correlation heatmap of organizational performance and employee engagement metrics is shown in Fig. 8.

Challenges and Barriers to Innovative Leadership

In the context of innovative leadership within organizations, Tables 19 and 20 provide detailed insights into how employees perceive the importance of innovative leadership for organizational success and the challenges that impede such innovation.

Table 19 presents descriptive statistics that demonstrate a generally positive recognition of the importance of innovative leadership, with a median and mode consistently at 3 and 4 respectively, indicating a neutral to positive sentiment towards innovation leadership's role in organizational success. Similarly, the challenges to driving innovation are perceived somewhat positively, albeit with slight variations. The standard deviations and variances for both metrics are relatively low (around 1.1), suggesting that responses are not widely dispersed, which indicates a consensus among the employees about these issues. However, the skewness and kurtosis values, being close to zero and negative, respectively, suggest a relatively flat distribution with fewer outliers, reflecting a broad agreement among the workforce with some reservations. In Table 20, the ANOVA results for the importance of innovative leadership show significant differences among groups ($F=5.505$, $p<.001$), suggesting that perceptions vary substantially among different employee segments. This significant variance could indicate that while some parts of the organization fully understand and appreciate the role of innovative leadership, others may not see it as crucial, possibly due to varying levels of exposure to leadership initiatives or differential impacts of such initiatives across the organization.

Leadership Development and Training

The assessment of leadership development and training across various tables offers a broad understanding of how such initiatives are perceived and aligned with organizational goals. Table 21 provides descriptive statistics that indicate a generally positive view of organizational commitment to leadership development and its perceived importance for organizational longevity. Metrics like mean values around 3.20 and modes consistently at 4 demonstrate that the majority of the responses lean positively. The distributions have moderate variability as shown by standard deviations just above 1.0 and slightly negative skewness, suggesting a clustering of responses towards the higher end of the scale. Table 22's ANOVA results reveal significant differences in perceptions among groups regarding the commitment to leadership development ($F=4.496$, $p=.001$), the importance of such development ($F=6.611$, $p<.001$), and the alignment of initiatives with organizational goals ($F=3.923$, $p=.004$). These results highlight disparities that could stem from different experiences or expectations among employees, suggesting a need for more tailored communication and training efforts to ensure a unified understanding and commitment to leadership development across the organization. In Table 23, Independent Samples T-Tests further analyze these perceptions, showing significant differences in views on organizational commitment to leadership development ($p=.030$ for equal variances assumed). This suggests that not all groups within the organization perceive leadership development efforts similarly, which may impact these initiatives' overall effectiveness and acceptance.

Finally, Table 24 presents the KMO and Bartlett's Test results, indicating moderate sampling adequacy (KMO=0.499) for conducting factor analysis on satisfaction with leadership training programs. However, the Bartlett's Test suggests that the variables may not be inter-correlated strongly enough to justify a robust factor analysis, as indicated by a non-significant p-value (0.128). Figure 9 depicts the correlation heatmap of perceptions of organizational leadership development metrics.

Table 24. KMO and Bartlett's Test of Sphericity Results for Analysis of Satisfaction with Leadership Training Programs.

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.499
Bartlett's Test of Sphericity	
Approx. Chi-Square	5.687
df	3
Sig.	.128

Conclusions

The demographic analysis reveals a workforce mainly comprising middle-aged adults, with an average age of 41.62 years and significant tenure averaging 16.74 years. This group, 43.6% of whom hold postgraduate degrees, is well-equipped for specialized tasks within the pharmaceutical sector. Their maturity and experience make them valuable for innovation and strategic decision-making. Examination of leadership styles among 383 participants shows varied perceptions.

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Transformational leadership is prevalent, receiving a positive reception, while transactional leadership shows less uniformity. Notable disparities in democratic and servant leadership styles suggest the need for leadership development strategies tailored to diverse preferences within the organization. Innovation within the organization is perceived positively, as indicated by median and mode statistics. However, ANOVA results point to significant differences in how innovation is perceived and implemented across divisions. Despite this, consistent recognition across groups suggests a supportive culture for innovation, highlighting the need for uniform strategies that enhance innovative leadership. The analysis shows moderate positivity in roles, recognition, and decision-making perceptions, with average ratings around 3.20. Significant variations in how valued and involved different groups feel indicate discrepancies across departments, emphasizing the need for initiatives that enhance inclusivity and uniform recognition to boost engagement and satisfaction.

Conflict of Interest

The authors of this research declare that there is no conflict of interest regarding the publication of this paper.

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