

Human Capital Management As A Strategic Mediator: Empirical Evidence From The Petroleum Industry in Tamil Nadu

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ABSTRACT

The present study aims at exploring the mediating role of Human Capital Management (HCM) between Organizational Culture (OC) and Psychological Empowerment (PE) with respect to Organizational Effectiveness (OE) in the Tamil Nadu petroleum industry. The research is framed within the Human Capital Theory (Becker, 1964), the Resource-Based View (Barney, 1991) and Spreitzer's (1995) Psychological Empowerment framework to develop and validate an integrated structural model based on the survey of 400 stratified workers in eight major petroleum organizations. Leadership Practices, Employee Engagement, Knowledge Accessibility, Workforce Optimization and Learning Capacity are the five sub-dimensions of HCM. Structural Equation Modelling (SEM) via AMOS confirms significant positive influences of OC ($\beta = 0.486$, $p < 0.001$) and PE ($\beta = 0.421$, $p < 0.001$) on HCM, and of HCM on OE ($\beta = 0.612$, $p < 0.001$). Partial mediation by indirect paths was confirmed by bootstrapped mediation analysis (via OC: HCM: OE: $\beta = 0.298$; PE: HCM: OE: $\beta = 0.257$). The study contributes to the HCM theory in the South Asian energy industry and offers practical recommendations for HR professionals in the petroleum industry.

1. INTRODUCTION

The petroleum industry is one of the most strategically important industrial clusters in South India, covering the sectors of refining, exploration, petrochemical production, and distribution. The effective management of human capital has become a key factor in the sustainability and performance of organizations in a world where disruption and competition by other nations are rapidly gaining momentum in the energy sector.

This investigation is directed by Human Capital Management (HCM) which is different from HRM because of the strategic emphasis on measuring and maximizing the value of human capital. This research fills an important void in the empirical literature by exploring the structural antecedents of HCM effectiveness, namely Organizational Culture and Psychological Empowerment; and the research further investigates the mediating role of HCM between the structural antecedents and the organizational effectiveness outcomes.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Human Capital Theory and HCM

The core logic behind viewing employee knowledge, skills and capabilities as capital assets which can earn economic returns is from the Human Capital Theory of Becker (1964). HCM, however, is a strategic management framework that focuses on the measurable impact of human capital contributions and on a link between these contributions and organizational goals (Ulrich et al., 2009).

2.2 The organizational culture has been identified as an antecedent.

Denison (1990) showed that cultural orientations in terms of involvement, consistency, adaptability, and mission are significant predictors of organizational performance. Competing Values Framework by Quinn and Rohrbaugh (1983) explains the differential ability to support the effectiveness of HCM practice of competing cultural orientations. Empirical meta-analyses (Hartnell et al., 2011) have been consistent with positive relationships between collaborative, innovation-oriented cultures and HCM outcomes.

2.3 Psychological Empowerment as an Antecedent

Spreitzer (1995) introduced the four-dimensional model of Psychological Empowerment (Meaning, Competence, Self-Determination, and Impact), which points to the fact that empowered employees are intrinsically motivated and have a proactive approach to organizational practices. Psychological empowerment is manifested through Kobasa's (1979) three categories (Hardiness, Control, Commitment) and affects the receptivity of HCM practices such as learning, knowledge sharing, leadership engagement.

2.4 HCM and Organizational Effectiveness

There is also evidence that high-performance HCM systems are positively associated with organizational outcomes such as productivity, financial performance, and competitive advantage (Combs et al., 2006; Jiang et al., 2012) that is robust and consistent across studies. Knowledge management and learning capacity dimensions of HCM are especially significant factors in the petroleum industry for the effectiveness of operations (Obeidat et al., 2016).

3. RESEARCH METHODOLOGY

3.1 Research Design

A positivist, deductive, cross-sectional survey design was adopted. The research proceeds from theoretically derived hypotheses to empirical testing using a structured multi-section questionnaire administered to petroleum industry employees across Tamil Nadu.

3.2 Operationalization of Variables

Table 1: Operationalization of Research Variables

Construct	Role	Dimensions	Items (n)	Scale & Source
Organizational Culture	Independent	Adaptability, Innovation, Participation, Strategic Flexibility	15	5-pt Likert; Denison (1990); Quinn (1983)
Psychological Empowerment	Independent	Control, Commitment, Challenge	12	5-pt Likert; Kobasa (1979); Maddi (2006)
HCM – Leadership Practices	Dependent	Communication, Partnership, Development, Succession	4	5-pt Likert; Ulrich et al. (2009)
HCM – Employee Engagement	Dependent	Job Design, Recognition, Workload, Retention	4	5-pt Likert; Kahn (1990); Schaufeli & Bakker (2004)
HCM – Knowledge Accessibility	Dependent	Tools, Teamwork, Best Practices, KM Systems	4	5-pt Likert; Nonaka & Takeuchi (1995)
HCM – Workforce Optimization	Dependent	Process, Resources, Accountability, Selection, PM	5	5-pt Likert; Boudreau & Ramstad (2007)

HCM – Learning Capacity	Dependent	Innovation, Training, Dev. Plans, Leadership, LMS	5	5-pt Likert; Senge (1990); Marsick & Watkins (2003)
Organizational Effectiveness	Outcome	Quality, Communication, Training, Consistency, Output	5	5-pt Likert; Cameron & Whetten (1983)

Source: Adapted from cited theoretical frameworks. All items use 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Total items: 54.

3.3 Research Hypotheses

The following twenty-two hypotheses — organized around the three primary relationship clusters — guide the empirical investigation:

Table 2: Comprehensive Research Hypotheses

H#	Hypothesis Statement	Expected Direction	Testing Method
H1	Organizational Culture → Human Capital Management (overall)	Positive	Multiple Regression / SEM Path
H1a	Organizational Culture → Leadership Practices	Positive	SEM Sub-path
H1b	Organizational Culture → Employee Engagement	Positive	SEM Sub-path
H1c	Organizational Culture → Knowledge Accessibility	Positive	SEM Sub-path
H1d	Organizational Culture → Workforce Optimization	Positive	SEM Sub-path
H1e	Organizational Culture → Learning Capacity	Positive	SEM Sub-path
H2	Psychological Empowerment → Human Capital Management (overall)	Positive	Multiple Regression / SEM Path
H2a	Psychological Empowerment → Leadership Practices	Positive	SEM Sub-path
H2b	Psychological Empowerment → Employee Engagement	Positive	SEM Sub-path
H2c	Psychological Empowerment → Knowledge Accessibility	Positive	SEM Sub-path
H2d	Psychological Empowerment → Workforce Optimization	Positive	SEM Sub-path
H2e	Psychological Empowerment → Learning Capacity	Positive	SEM Sub-path
H3	HCM → Organizational Effectiveness (overall)	Positive	Multiple Regression / SEM Path
H3a	Leadership Practices → Organizational Effectiveness	Positive	SEM Sub-path
H3b	Employee Engagement → Organizational Effectiveness	Positive	SEM Sub-path
H3c	Knowledge Accessibility → Organizational Effectiveness	Positive	SEM Sub-path

H3d	Workforce Optimization → Organizational Effectiveness	Positive	SEM Sub-path
H3e	Learning Capacity → Organizational Effectiveness	Positive	SEM Sub-path
H4	OC → OE mediated by HCM	Positive Indirect	Bootstrapping (5,000 resamples)
H5	PE → OE mediated by HCM	Positive Indirect	Bootstrapping (5,000 resamples)
H6	Demographic differences in HCM & OE perceptions	Significant	ANOVA / Independent t-test

Note: *** $p < 0.001$. Sub-hypotheses (H1a–H1e, H2a–H2e, H3a–H3e) test dimension-level relationships. All hypotheses stated in alternative (H1) form.

3.4 Population and Sample

Table 3: Population Distribution and Proportionate Sample Allocation

S.No.	Organization	Segment	Population (N _i)	Proportion	Sample (n _i)
1	CPCL (Manali + Cauvery Basin)	Refining	2,506	0.1856	74
2	IOCL – Tamil Nadu	Distribution & Retail	1,750	0.1296	52
3	BPCL – Tamil Nadu	Distribution & Retail	1,100	0.0815	33
4	HPCL – Tamil Nadu	Distribution & Retail	875	0.0648	26
5	ONGC – Cauvery Basin	Upstream E&P	1,500	0.1111	45
6	Manali Petrochemicals Ltd.	Petrochemicals	588	0.0436	17
7	Private Petroleum Retail & Distribution	Private Downstream	3,458	0.2561	103
8	Ancillary Petroleum Services	Services	1,800	0.1333	50
Total	All Segments	—	13,577	1.0000	400

Source: CPCL, IOCL, BPCL, HPCL, ONGC, MPL Annual Reports 2022-23; PNGRB Annual Report; TN Labour Dept. records. Sample size determined by Slovin's Formula ($N=13,500$, $e=0.05$): $n = 13,500 / (1 + 13,500 \times 0.0025) = 389 \rightarrow$ rounded to 400.

3.5 Analytical Strategy

Data analysis is carried out in the following 6 steps: (1) Descriptive statistics; (2) Reliability analysis (Cronbach's alpha, composite reliability); (3) Measurement model analysis using CFA (convergent and discriminant validity); (4) Structural model analysis using SEM-AMOS; (5) Bootstrapped mediation analysis (5,000 resamples); and (6) Testing of the demographic differences using ANOVA and independent t-tests. Analytical

4. FRAMEWORK & RESULTS

4.1 Descriptive Statistics

The descriptive statistics for all constructs are shown in Table 4. Petroleum industry employees perceive moderate to moderately high levels of OC, PE, HCM effectiveness, and OE on all of the mean scores on the 5-point scale. The standard deviations vary from 0.58 to 0.73, which are acceptable for statistical analysis.

Table 4: Descriptive Statistics of Research Constructs (N = 400)

Construct / Sub-Dimension	N	Mean	Std. Dev.	Skewness	Interpretation
Organizational Culture (Overall)	400	3.82	0.61	-0.41	Moderately High
Adaptability	400	3.91	0.58	-0.38	High
Innovation Orientation	400	3.74	0.67	-0.29	Moderately High
Participative Decision-Making	400	3.78	0.72	-0.44	Moderately High
Strategic Flexibility	400	3.86	0.63	-0.51	High
Psychological Empowerment (Overall)	400	3.69	0.64	-0.33	Moderately High
Control	400	3.72	0.68	-0.27	Moderately High
Commitment	400	3.81	0.59	-0.46	High
Challenge	400	3.54	0.71	-0.19	Moderate
HCM – Leadership Practices	400	3.77	0.65	-0.36	Moderately High
HCM – Employee Engagement	400	3.65	0.69	-0.28	Moderately High
HCM – Knowledge Accessibility	400	3.59	0.73	-0.22	Moderate
HCM – Workforce Optimization	400	3.71	0.66	-0.31	Moderately High
HCM – Learning Capacity	400	3.63	0.70	-0.25	Moderately High
HCM (Overall – Second Order)	400	3.67	0.62	-0.30	Moderately High
Organizational Effectiveness	400	3.74	0.60	-0.40	Moderately High

Note: Scale range 1–5 (5-point Likert). Mean > 3.50 indicates moderate-to-high levels. Skewness values between -0.19 and -0.51 confirm approximate normality.

4.2 Discriminant and Content Validity

All reliability and validity results are shown in Table 5. The Cronbach's alpha values are all greater than 0.70, which is considered high and is set by Nunnally (1978). All composite reliability values are within the range of 0.843 to 0.901, and all AVE values are within the range of 0.544 to 0.617, both of which are considered as the adequate convergent validity of all constructs (Fornell & Larcker, 1981).

Table 5: Reliability Analysis and Convergent Validity Assessment

Construct / Sub-Dimension	Cronbach's α	Composite Reliability	AVE	Factor Loadings Range	Validity Status
Organizational Culture	0.883	0.901	0.562	0.68 – 0.84	Convergent ✓
Psychological Empowerment	0.862	0.879	0.544	0.65 – 0.81	Convergent ✓
HCM – Leadership Practices	0.841	0.863	0.613	0.72 – 0.85	Convergent ✓
HCM – Employee Engagement	0.829	0.851	0.589	0.70 – 0.82	Convergent ✓
HCM – Knowledge Accessibility	0.817	0.843	0.571	0.67 – 0.80	Convergent ✓
HCM – Workforce Optimization	0.856	0.874	0.601	0.71 – 0.84	Convergent ✓

HCM – Learning Capacity	0.848	0.869	0.593	0.70 – 0.83	Convergent ✓
Organizational Effectiveness	0.872	0.889	0.617	0.73 – 0.86	Convergent ✓
Threshold (Required)	≥ 0.70	≥ 0.70	≥ 0.50	≥ 0.60	—

Note: AVE = Average Variance Extracted. CR = Composite Reliability. All Cronbach's α , $CR \geq 0.80$, $AVE \geq 0.50$ confirm adequate reliability and convergent validity.

4.3 Confirmatory Factor Analysis - Model Fit

Fit indices for the measurement model (CFA) and also structural model (SEM) are displayed in Table 6. All fit indices are within the recommended bounds and thus indicates an adequate fit of the model. The measurement model CFI is 0.946 and the RMSEA is 0.059, which are excellent. The structural model has a slightly poorer but still reasonable fit (CFI = 0.931, RMSEA = 0.066), in line with the works by Bollen et al. (1989) that noted satisfactory results for complex multi-construct models.

Table 6: CFA and SEM Model Fit Indices

Fit Index	Recommended Threshold	Measurement Model	Structural Model	Status
Chi-square / df (CMIN/DF)	< 3.0	2.41	2.68	Acceptable
Comparative Fit Index (CFI)	≥ 0.90	0.946	0.931	Good Fit
Tucker-Lewis Index (TLI)	≥ 0.90	0.938	0.922	Good Fit
RMSEA	≤ 0.08	0.059	0.066	Good Fit
SRMR	≤ 0.08	0.051	0.063	Good Fit
GFI (Goodness of Fit)	≥ 0.85	0.901	0.887	Acceptable
AGFI (Adjusted GFI)	≥ 0.80	0.878	0.861	Acceptable

Note: *** $p < 0.001$. Thresholds: CFI/TLI ≥ 0.90 ; RMSEA/SRMR ≤ 0.08 ; GFI ≥ 0.85 ; AGFI ≥ 0.80 (Hu & Bentler, 1999; Hair et al., 2019).

4.4 Correlation Analysis

The Pearson correlation matrix of the study constructs is presented in Table 7. The results of correlations are all positive and significant at $p < 0.01$, which give some preliminary support for all the directional hypotheses. HCM Overall exhibits the strongest correlation with OE ($r = 0.631$, $p < 0.01$), followed by OC $\rightarrow$ HCM ($r = 0.594$) and PE $\rightarrow$ HCM ($r = 0.537$). Discriminant validity is shown as there is no correlation coefficient between constructs greater than 0.65 and all AVE greater than the squared correlations between constructs.

Table 7: Pearson Correlation Matrix (N = 400)

Construct	(1)	(2)	(3)	(4)	(5)	(6)
Organizational Culture	1.000					
Psychological Empowerment	0.512**	1.000				
HCM – Leadership Practices	0.561**	0.493**	1.000			
HCM – Employee Engagement	0.483**	0.518**	0.607**	1.000		
HCM – Overall (2nd Order)	0.594**	0.537**	0.741**	0.728**	1.000	
Organizational Effectiveness	0.487**	0.462**	0.538**	0.521**	0.631**	1.000

Note: ** $p < 0.01$ (2-tailed). Values on diagonal = 1.000. Discriminant validity confirmed: all $\sqrt{AVE} >$ inter-construct correlations (Fornell-Larcker criterion).

4.5 Multiple Regression Analysis: OC and PE as Predictors of HCM Sub-Dimensions

Standardized regression coefficients for each HCM sub-dimension regressed on OC and PE simultaneously are shown in Table 8. All regression coefficients are positive and significant ($p < 0.001$) and thus support H1 (H1a-H1e) and H2 (H2a-H2e). OC has the highest contribution to Learning Capacity ($\beta = 0.443$) and Workforce Optimization ($\beta = 0.428$) and PE, highest contribution to Employee Engagement ($\beta = 0.401$) and Learning Capacity ($\beta = 0.421$).

Table 8: Multiple Regression Results - OC and PE Predicting HCM Sub-Dimensions

Dependent Variable (HCM Dimension)	Predictor	β (Std.)	t-value	p-value	Decision
Leadership Practices	Org. Culture	0.412	7.83	< 0.001	H1a Supported
	Psych. Empowerment	0.338	6.41	< 0.001	H2a Supported
Employee Engagement	Org. Culture	0.374	7.01	< 0.001	H1b Supported
	Psych. Empowerment	0.401	7.54	< 0.001	H2b Supported
Knowledge Accessibility	Org. Culture	0.396	7.38	< 0.001	H1c Supported
	Psych. Empowerment	0.359	6.72	< 0.001	H2c Supported
Workforce Optimization	Org. Culture	0.428	8.12	< 0.001	H1d Supported
	Psych. Empowerment	0.317	5.89	< 0.001	H2d Supported
Learning Capacity	Org. Culture	0.443	8.41	< 0.001	H1e Supported
	Psych. Empowerment	0.421	7.96	< 0.001	H2e Supported

Note: *** $p < 0.001$. β = standardized regression coefficient. All models control for demographic variables. VIF values ranged from 1.42 to 2.17, confirming absence of multicollinearity.

4.6 Data from multiple regression analysis were used to identify HCM sub-dimensions that predict organizational effectiveness.

Table 9 shows regression results of OE regressed on the five sub-dimensions of HCM together. The combined model explains 52.4% of the variance in OE ($R^2 = 0.524$, $F = 87.34$, $p < 0.001$), indicating strong predictive power. The strongest individual predictors are Learning Capacity ($\beta = 0.373$) and Employee Engagement ($\beta = 0.341$) followed by Leadership Practices ($\beta = 0.318$), Workforce Optimization ($\beta = 0.304$), and Knowledge Accessibility ($\beta = 0.287$).

Table 9: Multiple Regression Results - HCM Sub-Dimensions Predicting Organizational Effectiveness

HCM Dimension (Predictor)	β (Std.)	t-value	p-value	R^2	Decision
Leadership Practices	0.318	5.96	< 0.001		H3a Supported
Employee Engagement	0.341	6.38	< 0.001		H3b Supported
Knowledge Accessibility	0.287	5.34	< 0.001		H3c Supported
Workforce Optimization	0.304	5.67	< 0.001		H3d Supported
Learning Capacity	0.373	6.98	< 0.001		H3e Supported
Model (Combined HCM $\rightarrow$ OE)	0.631	—	< 0.001	0.524 (52.4%)	H3 Supported

Note: *** $p < 0.001$. Combined model: $R^2 = 0.524$, Adjusted $R^2 = 0.517$, $F(5, 394) = 87.34$, $p < 0.001$.

4.7 Structural Equation Modelling - Path Analysis

The standardized path coefficients obtained from the SEM analysis are shown in Table 10. All direct path hypothesized are significant at $p < 0.001$. OC exerts a stronger direct effect on HCM ($\beta = 0.486$) than PE ($\beta = 0.421$). Oesophagus and heart catheterization have a significant positive correlation with HCM ($\beta = 0.612$). The significant but smaller direct effects of OC and PE on OE ($\beta = 0.143$ and $\beta = 0.118$ respectively) indicate that HCM partially mediates these relationships.

Table 10: SEM Path Coefficients - Full Structural Model

Path	Std. Path Coefficient (β)	S.E.	C.R.	p-value	Supported?
OC $\rightarrow$ HCM (Overall)	0.486	0.071	6.845	***	Yes
PE $\rightarrow$ HCM (Overall)	0.421	0.068	6.191	***	Yes
HCM $\rightarrow$ OE	0.612	0.082	7.463	***	Yes
OC $\rightarrow$ OE (Direct)	0.143	0.063	2.270	0.023	Partial Mediation
PE $\rightarrow$ OE (Direct)	0.118	0.059	2.000	0.046	Partial Mediation
OC $\rightarrow$ HCM $\rightarrow$ OE (Indirect)	0.298	0.058	—	< 0.01	H4 Supported
PE $\rightarrow$ HCM $\rightarrow$ OE (Indirect)	0.257	0.054	—	< 0.01	H5 Supported

Note: *** $p < 0.001$. S.E. = Standard Error; C.R. = Critical Ratio (equivalent to z-statistic). Indirect effects estimated via bootstrapping (5,000 resamples). 95% bias-corrected confidence intervals for indirect effects do not include zero.

4.8 Mediation Analysis

The mediation analysis outcome is shown in table 11. Both indirect paths (OC to HCM to OE and PE to HCM to OE) had bootstrap 95% confidence intervals that do not contain zero, indicating statistically significant mediation. The presence of meaningful direct influence of both OC and PE on OE supports partial (not complete) mediation, which is in line with theoretical predictions of other pathways that culture and empowerment can impact effectiveness, apart from HCM.

Table 11: Mediation Analysis - Bootstrapped Indirect Effects (N = 5,000 Resamples)

Mediation Path	Total Effect	Direct Effect	Indirect Effect	95% CI (Boot.)	Mediation Type
OC $\rightarrow$ HCM $\rightarrow$ OE	0.441	0.143	0.298	[0.204, 0.391]	Partial Mediation
PE $\rightarrow$ HCM $\rightarrow$ OE	0.375	0.118	0.257	[0.172, 0.342]	Partial Mediation

Note: 95% Bias-corrected confidence intervals (CI) computed via bootstrapping. CI excludes zero for both paths, confirming significant mediation (Hayes, 2018). Partial mediation confirmed as direct effects remain significant.

4.9 Average group differences by demographic group (ANOVA).

Table 12 shows the results of one-way ANOVA test of H6. All five demographic variables show statistically significant differences between HCM and OE perceptions, which support H6. The perceived effectiveness of HCM effectiveness is highest for organization type (PSU vs. private, Mean Diff. = 0.47, $F = 12.63$, $p < 0.001$). There are considerable differences in age group and educational level as well, with the HCM and OE level perceived as being higher with senior and more educated employees.

Table 12: One-Way ANOVA - Demographic Differences in HCM and OE Perceptions

Demographic Variable	Groups Compared	HCM Mean Diff.	F-value	p-value	OE Mean Diff.	Decision
Gender	Male vs. Female	0.21	4.83	0.028	0.19	Significant (H6 ✓)
Age Group	< 30 / 30–45 / > 45	0.34	8.67	< 0.001	0.28	Significant (H6 ✓)
Education Level	Diploma / UG / PG / PhD	0.41	10.21	< 0.001	0.33	Significant (H6 ✓)
Years of Service	< 5 / 5–15 / 15–25 / > 25	0.38	9.14	< 0.001	0.31	Significant (H6 ✓)
Organization Type	PSU vs. Private	0.47	12.63	< 0.001	0.39	Significant (H6 ✓)

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All Levene's test results confirm homogeneity of variance ($p > 0.05$). Post-hoc comparisons conducted using Tukey's HSD.

4.10 Summary of Hypothesis Testing

All Results of Hypothesis Tests are summarized in Table 13. There is support for all 22 hypotheses, with the mediation hypotheses (H4, H5) confirmed as partial mediation and the demographic differences (H6) confirmed across all five demographic variables. Table 13: Consolidated Hypothesis Testing Summary

H#	Hypothesis	β / Indirect Effect	p-value	Outcome
H1	OC $\rightarrow$ HCM (Overall)	0.486	***	Supported
H1a–e	OC $\rightarrow$ HCM Sub-Dimensions (all)	0.374–0.443	***	All Supported
H2	PE $\rightarrow$ HCM (Overall)	0.421	***	Supported
H2a–e	PE $\rightarrow$ HCM Sub-Dimensions (all)	0.317–0.421	***	All Supported
H3	HCM $\rightarrow$ OE	0.612	***	Supported
H3a–e	HCM Sub-Dimensions $\rightarrow$ OE (all)	0.287–0.373	***	All Supported
H4	OC $\rightarrow$ HCM $\rightarrow$ OE (Indirect)	0.298	< 0.01	Supported (Partial Mediation)
H5	PE $\rightarrow$ HCM $\rightarrow$ OE (Indirect)	0.257	< 0.01	Supported (Partial Mediation)
H6	Demographic Differences in HCM & OE	F = 4.83–12.63	< 0.05	Supported

Note: *** $p < 0.001$. All hypotheses supported. β values from SEM structural model. Mediation type determined by significance of both direct and indirect effects.

5. DISCUSSION AND IMPLICATIONS

5.1 Theoretical Contributions

All of the hypotheses are confirmed, contributing to HCM theory in three significant ways. First, it provides empirical evidence of the validity of the causal chain in the context of oil-based industries in South Asia—a non-Western cultural and industrial environment that is not well represented by existing frameworks. Secondly, the Hardiness Scale as a proxy for psychological empowerment is a methodologically validated proxy. Third, the five-dimensional HCM second order construct shows good psychometric properties (CR = 0.879–0.901, AVE = 0.544–0.617) that could be used in future research in the petroleum and energy sector.

5.2 Practical Implications

Based on the results, Learning Capacity ($\beta = 0.373$) and Employee Engagement ($\beta = 0.341$) are the most significant HCM variables among other HCMs to measure the OE, indicating that petroleum companies should focus their investment on the organization's learning capacity and organizational engagement management. When compared against the private sector, the HCM perception difference between the PSU and private sector is significant (Mean Diff. = 0.47, $p < 0.001$) which highlights the need for culture change interventions in PSUs, especially in the area of adaptability and innovation cultural dimension perceived as most strongly associated with HCM effectiveness in the PSU.

6. CONCLUSION

This study validates an extensive, empirically supported structural model of HCM's influence on organizational effectiveness, in the context of the Tamil Nadu petroleum sector. The analytical framework based on the positivist perspective, using SEM, shows that there are direct influences from OC to HCM and from HCM to OE with HCM being partially mediating for both paths. The model has an explained variance of 0.524, which explains a high percentage of the variance in OE and has great explanatory power and can serve as a solid basis for future longitudinal and comparative studies in the energy sector.

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