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Design and Testing of a Culturally-Excellence-Based Ethical Leadership Model in the Petrochemical Industry Using Structural Equation Modeling

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Abstract

This study aims to design and test a culturally-excellence-based ethical leadership model in the Iranian petrochemical industry using a mixed-methods approach and structural equation modeling. The research adopted a sequential exploratory mixed-methods design. In the qualitative phase, grounded theory was employed to identify the dimensions of ethical leadership through semi-structured interviews with 19 experts, managers, and academics in the petrochemical sector. The data were analyzed using open, axial, and selective coding. In the quantitative phase, a researcher-developed questionnaire was distributed to a randomly selected sample of 385 employees from the Persian Gulf Petrochemical Industries Company. The data were analyzed using SPSS and SmartPLS software, with structural equation modeling (PLS-SEM) used to assess the relationships between variables. Reliability and validity were confirmed through Cronbach's alpha, composite reliability, AVE, and HTMT. The Kolmogorov–Smirnov test results confirmed non-normal data distribution, justifying the use of PLS-SEM. All hypothesized relationships in the structural model were statistically significant ($p < 0.01$). Causal conditions had a positive effect on the ethical leadership phenomenon ($\beta = 0.497$, $t = 11.671$), and also influenced contextual ($\beta = 0.350$) and intervening conditions ($\beta = 0.541$). Contextual conditions strongly predicted both the ethical leadership phenomenon ($\beta = 0.613$) and outcomes ($\beta = 0.560$). Intervening conditions significantly affected the ethical leadership construct ($\beta = 0.656$), strategies ($\beta = 0.603$), and outcomes ($\beta = 0.650$). The leadership phenomenon itself significantly influenced strategic actions ($\beta = 0.644$), which in turn had the strongest effect on outcomes ($\beta = 0.859$). R^2 values indicated high explanatory power across all endogenous constructs. The results confirm the validity and applicability of the proposed model, highlighting the role of ethical leadership as both a cultural imperative and a strategic mechanism for achieving organizational effectiveness in the petrochemical industry.

Keywords: Ethical Leadership; Cultural Excellence; Petrochemical Industry; Grounded Theory.

1. Introduction

The emergence of ethical leadership as a strategic necessity in contemporary organizations has elevated the discourse around values-driven management and cultural integrity. In sectors characterized by intense competition, regulatory scrutiny, and environmental sensitivity—such as the petrochemical industry—ethical leadership is not merely an aspirational ideal but a critical driver of organizational legitimacy and sustainable performance. Ethical leadership, broadly defined, involves the

demonstration of normatively appropriate conduct through personal actions and interpersonal relationships and the promotion of such conduct among followers through communication, reinforcement, and decision-making (Kim & Lee, 2024; Schwartz, 2013). In particular, the alignment of leadership behavior with culturally rooted values becomes essential in high-stakes industries where stakeholder trust, environmental responsibility, and social accountability are central to long-term viability (Tamer, 2021).

The literature has increasingly converged on the view that ethical leadership and organizational culture are inextricably linked, forming a mutually reinforcing loop that shapes employee behavior, decision-making systems, and institutional resilience (Ghanbari & Abdolmaleki, 2019; King et al., 2020). Ethical leadership fosters climates in which fairness, transparency, and accountability are internalized by members of the organization, contributing to a coherent ethical culture (Carakos, 2018). Conversely, a strong ethical culture provides the normative infrastructure that legitimizes and supports ethical leadership practices, signaling acceptable behavior and reinforcing trust-based norms (Ouma, 2017; Schwartz, 2013). The petrochemical sector, given its strategic role in national economies and its exposure to environmental and public concerns, presents a particularly compelling context for exploring this interaction. In such environments, leadership must transcend technical efficiency and embody ethical foresight to foster reputational capital, mitigate risks, and enhance organizational cohesion (Montakhab et al., 2016).

Empirical research affirms that ethical leadership is strongly associated with positive employee outcomes, including higher organizational commitment, reduced deviance, and enhanced work engagement (Ghanbari & Abdolmaleki, 2019; Mohammadi Komroudi et al., 2024). These relationships are often mediated by constructs such as affective commitment and perceptions of ethical climate, underscoring the central role of culture as a transmission mechanism (Carakos, 2018; Montakhab et al., 2016). When employees perceive their leaders as morally consistent and just, they are more likely to internalize organizational goals, invest in collective performance, and refrain from opportunistic behavior (Karimi et al., 2013; Royayi Ramazani et al., 2012). Furthermore, ethical leadership supports the development of intellectual capital and long-term innovation by fostering psychological safety and participatory governance (Ullah et al., 2019; Ullah et al., 2022). These outcomes are particularly relevant in complex technical fields like petrochemicals, where human capital and operational precision are vital assets.

The strategic implications of ethical leadership extend beyond internal dynamics. In the broader governance and sustainability discourse, ethical leadership is regarded as a cornerstone of environmental, social, and governance (ESG) frameworks, especially in public and semi-public organizations (Zahari et al., 2024). Ethical leaders contribute to the institutionalization of ESG practices by modeling responsible conduct and aligning corporate objectives with societal expectations. This is especially evident in emerging economies, where the legitimacy of both private and public institutions hinges on transparent and equitable leadership behavior (Huff et al., 2023). In this regard, ethical leadership can act as a catalyst for cultural transformation, ensuring that organizational systems are inclusive, forward-looking, and aligned with broader developmental goals (Tamer, 2021; Zahari et al., 2024).

Yet, despite the growing scholarly attention, the mechanisms through which ethical leadership operates within specific industrial and cultural contexts remain under-theorized. Many existing studies are conducted in generalized service or governmental sectors, leaving a gap in understanding how ethical leadership manifests in capital-intensive, technically specialized industries like petrochemicals. Moreover, there is a relative scarcity of empirical work that integrates ethical leadership with indigenous cultural frameworks and sectoral dynamics, particularly in non-Western settings. This gap calls for context-sensitive models that account for both the universal dimensions of ethical leadership and the culturally specific expectations of leadership excellence (Kim & Lee, 2024; Mohammadi Komroudi et al., 2024). The current study addresses this need by designing and testing a culturally-rooted ethical leadership model in Iran's petrochemical industry, using a grounded theory approach followed by quantitative structural equation modeling.

The Iranian petrochemical sector provides a unique empirical context for such inquiry. As one of the most strategic pillars of the country's economy, the industry is characterized by hierarchical decision-making structures, technical complexity, and international exposure—all of which influence leadership expectations and ethical standards (Ghanbari & Abdolmaleki,

2019; Montakhab et al., 2016). Additionally, the intersection of national cultural values, organizational mission, and external environmental pressures creates a multifaceted leadership landscape where ethical challenges abound. Leaders in this context are expected not only to ensure operational success but also to embody cultural ideals and project organizational legitimacy (Royayi Ramazani et al., 2012; Schwartz, 2013). This interplay between ethical integrity and cultural excellence serves as the conceptual foundation for the model proposed in this study.

The methodological rigor of this research lies in its adoption of a mixed-methods strategy, beginning with a qualitative exploration through grounded theory to identify the dimensions of ethical leadership grounded in the local cultural context. This approach aligns with calls in the literature for inductive theory development that is sensitive to contextual variations and sectoral complexities (Mohammadi Komroudi et al., 2024; Ouma, 2017). The qualitative findings were then operationalized and validated through a quantitative phase using Partial Least Squares Structural Equation Modeling (PLS-SEM), enabling the assessment of causal relationships between the identified dimensions and key organizational outcomes. By employing both inductive and deductive reasoning, the study ensures theoretical robustness and practical relevance, contributing to both academic discourse and managerial practice.

In synthesizing prior literature and addressing the empirical gap, this study proposes that ethical leadership based on cultural excellence functions as both a normative framework and a performance strategy in complex industrial systems.

2. Methods and Materials

This study employed a mixed-methods design, combining both qualitative and quantitative approaches to explore and validate a culturally-rooted ethical leadership model specific to the petrochemical industry. At its core, the research adopted a two-phase sequential design. The first phase involved a qualitative exploration aimed at constructing a conceptual model based on grounded theory. This phase focused on inductive reasoning, allowing categories and theoretical constructs to emerge directly from the empirical data without preconceived assumptions. The second phase involved a quantitative assessment to test the fitness and structure of the proposed model through statistical analysis, specifically employing structural equation modeling.

In the qualitative phase, the population included senior managers, domain experts, academic faculty members, and specialists in the petrochemical sector. Sampling was purposive and snowball in nature, targeting individuals with rich insights into organizational leadership and cultural excellence within the industry. Data saturation was achieved after 19 semi-structured, interactive interviews, confirming that no new significant themes were emerging. The interview protocol was developed using theoretical literature and expert consultation, ensuring content relevance and contextual appropriateness. Interviews were conducted ethically, recorded with participants' consent, transcribed verbatim, and systematically coded. Data analysis followed the three-step procedure of grounded theory. First, during open coding, the data were broken down into discrete parts, leading to the identification of initial concepts and their classification into primary categories. In the axial coding stage, relationships among categories were established, resulting in the delineation of causal conditions, contextual factors, intervening conditions, strategies, and consequences surrounding the central phenomenon. In the selective coding stage, the core category of "culturally-excellence-based ethical leadership" was identified and used to integrate all other categories into a cohesive theoretical framework. A storyline was developed to narrate the logical connections between the identified categories and the core phenomenon. Validity and trustworthiness of the qualitative findings were ensured through triangulation, peer debriefing, member checking, and diversity of the participant pool across organizational levels and areas of expertise.

In the quantitative phase, the target population consisted of employees of the Persian Gulf Petrochemical Industries Company. The sample size was determined using Cochran's formula with a 95% confidence level, yielding a final sample of 385 participants selected via simple random sampling. Sampling was conducted in accordance with Morgan's table and tailored to the total population size. The quantitative data were collected using a researcher-developed questionnaire derived from the categories identified in the qualitative stage. The finalized instrument comprised 42 items, each measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree." This instrument was carefully developed to reflect the multidimensional nature of culturally-informed ethical leadership as articulated in the grounded theory model.

To assess the validity of the instrument, both face validity and content validity were evaluated. Experts from academia and industry were consulted to refine the questionnaire items. The Content Validity Ratio (CVR) and the Content Validity Index

(CVI) were calculated, with all items exceeding the critical CVR threshold of 0.62 and CVI threshold of 0.78, based on Lawshe's table, thereby confirming the items' conceptual and practical relevance. The reliability of the instrument was examined through Cronbach's alpha, yielding a value of 0.89, indicating excellent internal consistency. Furthermore, construct reliability and validity were assessed through composite reliability (CR), average variance extracted (AVE), and heterotrait-monotrait (HTMT) ratio, all of which supported the robustness of the instrument in measuring the intended latent constructs.

Data analysis in the quantitative stage was conducted using SPSS and SmartPLS software. Given the non-normal distribution of the data, confirmed through the Kolmogorov–Smirnov test, the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach was employed. This analytical technique was appropriate due to its flexibility with non-parametric data and suitability for exploratory model testing. PLS-SEM enabled the simultaneous estimation of relationships between observed and latent variables, offering a powerful tool for assessing the proposed theoretical model's predictive and explanatory capabilities. The model was evaluated using standard criteria, including path coefficients, t-values, R^2, effect sizes (f^2), and model fit indices.

The integrated methodological strategy of this research ensured both depth and rigor. The qualitative phase provided rich, contextually grounded insights into the conceptual components of ethical leadership in a culturally sensitive framework, while the quantitative phase empirically tested and validated these components within a representative sample of the industry workforce. The combined use of grounded theory and PLS-SEM offered a methodologically robust pathway for theory development and model testing, thereby contributing both to theoretical enrichment and practical application in the field of leadership studies within industrial organizations.

3. Findings and Results

The qualitative findings of this study were derived from a comprehensive analysis of 19 semi-structured interviews with experts, managers, and academics in the petrochemical industry. Through open coding, a total of 275 initial codes were extracted. These were further refined through axial coding into 63 distinct concepts grouped under 30 subcategories and ultimately classified into six major dimensions based on Strauss and Corbin's paradigm model: causal conditions, contextual conditions, intervening conditions, the central phenomenon, strategies, and consequences. The paradigm framework facilitated understanding how these components interrelate by revealing causal relationships, contextual influences, strategic responses, and resulting outcomes. In axial coding, attention was paid to the recurring patterns and conceptual linkages, enabling the formulation of an integrated model that positioned "ethical leadership based on cultural excellence" as the core phenomenon. The use of constant comparative analysis and theoretical sampling allowed the researcher to ensure conceptual saturation and internal coherence. Selective coding then led to the integration of all categories into a cohesive storyline, confirming the emergence of a grounded theory explaining ethical leadership within a culturally embedded framework.

Table 1. Dimensions and Subcategories Extracted from Qualitative Analysis

Dimension	Subcategories
Causal Conditions	Decline in organizational citizenship and motivation
	Need for personal and professional development
	Importance of company reputation and relations
	Social and environmental risks
	Increased market risks
Contextual Conditions	Organizational culture and values
	Policies, communication, and procedures
	Training and development systems
	Managerial structure
Intervening Conditions	Financial and economic conditions
	Socio-cultural and ethical conditions
	Nature of work and employee expertise
	Individual factors
Central Phenomenon	Growth of ethical and citizenship behaviors
	Enhanced organizational credibility and transparency
	Individual and professional development
	Growth of social and environmental responsibility
	Improvement of individual and organizational performance
Strategies	Developing and disseminating values and culture
	Enhancing communication and transparency

	Participatory management and decision-making
	Continuous training, evaluation, and feedback
	Encouraging social and environmental responsibility
	Ensuring justice and meritocracy
	Fair compensation systems
Consequences	Enhanced internal and external credibility and communication
	Reduced organizational risk
	Growth of organizational culture and citizenship
	Increased satisfaction, commitment, and motivation
	Improved organizational performance and effectiveness
	Emergence of sustainable managerial thinking and culture
	Growth and development of employees

The results of the qualitative phase confirmed that ethical leadership within the petrochemical industry is a multifaceted construct that arises from a complex interaction between organizational, environmental, and individual-level conditions. Causal conditions such as reduced employee motivation and increasing reputational risks trigger the emergence of ethical leadership as a pivotal phenomenon. This phenomenon is shaped by contextual factors including existing cultural values and structural processes within organizations. Intervening conditions—such as the broader economic climate, employee characteristics, and job demands—further influence the pathways through which ethical leadership develops. In response, organizations employ strategies such as promoting values-based culture, transparency, participatory leadership, and justice-oriented HR practices. These strategies yield observable consequences, including enhanced credibility, risk mitigation, performance improvement, and the establishment of a sustainable leadership culture. This coding process facilitated the construction of a theory rooted in empirical realities, providing a dynamic, system-oriented model for ethical leadership grounded in cultural excellence.

The demographic profile of the quantitative sample, consisting of 385 employees from the Persian Gulf Petrochemical Industries Company, indicates a pronounced gender imbalance, with 97% of participants being male (373 individuals) and only 3% female (12 individuals). In terms of educational attainment, the majority of respondents held a master's degree, accounting for 67% of the sample (259 individuals), followed by those with doctoral degrees at 17% (65 individuals), and bachelor's degrees at 16% (61 individuals). The age distribution revealed that most participants were between 36 and 45 years old, representing 57% of the sample (229 individuals), while 30% were older than 46 years (122 individuals), and 13% were between 26 and 35 years of age (54 individuals); no participants were younger than 25. Regarding work experience, 34% of the respondents (129 individuals) had 11 to 15 years of service, 30% (117 individuals) had 6 to 10 years, 15% (58 individuals) had 16 to 20 years, 13% (51 individuals) had over 20 years, and only 8% (30 individuals) had five years of experience or less. This demographic composition reflects a predominantly experienced, highly educated, and male-dominated workforce in the petrochemical sector.

Table 2. Kolmogorov–Smirnov Test Results for Normality

Variable	Sample Size	Mean	Standard Deviation	Kolmogorov–Smirnov Statistic	Sig. (p-value)
Causal Conditions	385	3.599	0.719	0.083	0.001
Contextual Conditions	385	3.693	0.685	0.092	0.000
Intervening Conditions	385	3.851	0.766	0.214	0.000
Ethical Leadership Phenomenon Based on Cultural Excellence	385	3.222	0.909	0.287	0.003
Main Strategies and Actions	385	3.849	0.704	0.188	0.000
Outcomes	385	3.885	0.790	0.227	0.000

The results of the Kolmogorov–Smirnov test, presented in Table 2, indicate that the distribution of all variables significantly deviates from normality, as all p-values are below 0.05. Specifically, the ethical leadership phenomenon based on cultural excellence yielded the highest deviation (K–S = 0.287, p = 0.003), while causal conditions showed the lowest (K–S = 0.083, p = 0.001). These findings justified the use of non-parametric analytical techniques such as Partial Least Squares Structural Equation Modeling (PLS-SEM) for further analysis.

Table 3. Composite Reliability and Cronbach's Alpha for Construct Reliability

Variable	Composite Reliability	Cronbach's Alpha
Causal Conditions	0.915	0.900
Contextual Conditions	0.886	0.884
Intervening Conditions	0.844	0.833
Ethical Leadership Phenomenon Based on Cultural Excellence	0.903	0.895
Main Strategies and Actions	0.871	0.858
Outcomes	0.801	0.783

As shown in Table 3, all constructs demonstrated strong internal consistency. Composite reliability values exceeded the recommended threshold of 0.70 for all variables, ranging from 0.801 (Outcomes) to 0.915 (Causal Conditions). Similarly, Cronbach's alpha values were all above 0.78, confirming the reliability of the measurement model. These results affirm the robustness of the instrument in consistently capturing the intended latent variables.

Table 4. Assessment of Convergent Validity (Average Variance Extracted – AVE)

Variable	AVE
Causal Conditions	0.591
Contextual Conditions	0.517
Intervening Conditions	0.632
Ethical Leadership Phenomenon Based on Cultural Excellence	0.553
Main Strategies and Actions	0.576
Outcomes	0.644

Convergent validity was assessed using the Average Variance Extracted (AVE), with results presented in Table 4. All constructs reported AVE values above the minimum acceptable threshold of 0.50, indicating that more than 50% of the variance of indicators is explained by their corresponding latent constructs. The highest AVE was observed for Outcomes (0.644), while the lowest acceptable AVE belonged to Contextual Conditions (0.517), confirming the convergent validity of the model.

Table 5. Minimum Acceptable CVR Values by Number of Expert Raters (Lawshe Table)

Number of Evaluators	Minimum Acceptable CVR	Number of Evaluators	Minimum Acceptable CVR
5	0.91	18	0.45
7	0.85	19	0.44
9	0.78	20	0.42
11	0.59	25	0.37
13	0.54	30	0.33
15	0.49	35	0.31
17	0.47	40	0.29

Table 5 presents Lawshe's critical values for the Content Validity Ratio (CVR) based on the number of expert raters. Given that this study employed 19 experts to evaluate the instrument, the minimum acceptable CVR was determined to be 0.44. All questionnaire items exceeded this benchmark, confirming the adequacy of the content validity. This ensures that the items selected for measurement appropriately reflect the domain of culturally rooted ethical leadership in the petrochemical industry.

Table 6. Heterotrait-Monotrait (HTMT) Ratio for Discriminant Validity

Construct	Causal	Intervening	Contextual	Phenomenon	Strategies	Outcomes
Causal	–	0.589	0.458	0.634	0.492	0.615
Intervening	0.589	–	0.526	0.721	0.647	0.485
Contextual	0.458	0.526	–	0.538	0.492	0.639
Ethical Leadership Phenomenon	0.634	0.721	0.538	–	0.628	0.585
Strategies	0.492	0.647	0.492	0.628	–	0.396
Outcomes	0.615	0.485	0.639	0.585	0.396	–

As displayed in Table 6, the HTMT values for all construct pairs are below the conservative threshold of 0.85, which confirms the presence of discriminant validity among the variables of the research model. The highest HTMT value was observed between the ethical leadership phenomenon and intervening conditions (0.721), while the lowest occurred between strategies and outcomes (0.396). These results confirm that each latent construct is distinct from the others and that the indicators of each variable are not measuring unrelated constructs.

Table 7. Standardized Factor Loadings of Questionnaire Items

Construct	Question Numbers and Loadings
Causal Conditions	Q1 (0.620), Q2 (0.750), Q3 (0.703), Q4 (0.841), Q5 (0.867), Q6 (0.700), Q7 (0.939), Q8 (0.758)
Contextual Conditions	Q9 (0.751), Q10 (0.647), Q11 (0.697), Q12 (0.826), Q13 (0.815), Q14 (0.710), Q15 (0.771), Q16 (0.924)
Intervening Conditions	Q17 (0.857), Q18 (0.692), Q19 (0.884), Q20 (0.636), Q21 (0.773), Q22 (0.780), Q23 (0.725), Q24 (0.781)
Ethical Leadership Phenomenon	Q25 (0.889), Q26 (0.731), Q27 (0.760), Q28 (0.812), Q29 (0.785), Q30 (0.716), Q31 (0.610), Q32 (0.725)
Main Strategies and Actions	Q33 (0.750), Q34 (0.826), Q35 (0.750), Q36 (0.905), Q37 (0.681), Q38 (0.760), Q39 (0.838), Q40 (0.705)
Outcomes	Q41 (0.671), Q42 (0.916), Q43 (0.797), Q44 (0.711), Q45 (0.782), Q46 (0.815), Q47 (0.604)

Table 7 presents the standardized factor loadings of the 47 items used to measure the six constructs in the research model. All item loadings exceed the minimum acceptable threshold of 0.60, indicating adequate convergent validity at the item level. Notably, the highest loading was observed in Q7 (0.939) under causal conditions and Q42 (0.916) under outcomes, reflecting strong associations with their respective latent constructs. The lowest acceptable loading appeared in Q47 (0.604), which still satisfies reliability criteria. These results confirm the suitability of the questionnaire items in representing the conceptual dimensions of culturally rooted ethical leadership in the petrochemical context.

Table 8. t-Statistics (Significance Coefficients) for Standardized Factor Loadings

Construct	Question Numbers and t-Values
Causal Conditions	Q1 (39.735), Q2 (48.852), Q3 (46.825), Q4 (56.952), Q5 (58.976), Q6 (44.811), Q7 (60.951), Q8 (50.870)
Contextual Conditions	Q9 (47.862), Q10 (42.757), Q11 (46.812), Q12 (53.937), Q13 (52.926), Q14 (47.820), Q15 (48.881), Q16 (61.935)
Intervening Conditions	Q17 (52.970), Q18 (46.814), Q19 (50.995), Q20 (41.747), Q21 (47.885), Q22 (47.890), Q23 (44.836), Q24 (46.891)
Ethical Leadership Phenomenon	Q25 (59.913), Q26 (48.842), Q27 (48.871), Q28 (49.922), Q29 (46.896), Q30 (45.827), Q31 (39.720), Q32 (44.836)
Main Strategies and Actions	Q33 (46.860), Q34 (50.937), Q35 (48.861), Q36 (49.916), Q37 (42.790), Q38 (44.870), Q39 (51.948), Q40 (48.817)
Outcomes	Q41 (40.781), Q42 (59.527), Q43 (50.715), Q44 (43.831), Q45 (46.891), Q46 (52.925), Q47 (38.651)

Table 8 presents the significance coefficients (t-values) for the factor loadings of the questionnaire items. All t-values are well above the minimum threshold of 1.96, indicating that each item significantly contributes to its corresponding latent construct at a confidence level above 99%. The highest t-values are found for Q16 (61.935) under contextual conditions and Q7 (60.951) under causal conditions, while the lowest acceptable significance still belongs to Q47 (38.651) under outcomes. These results confirm the strong statistical significance and reliability of each measurement item within the model.

Table 9. Coefficient of Determination (R^2) for Latent Variables

Construct	R^2 Value
Causal Conditions	–
Contextual Conditions	0.825
Intervening Conditions	0.583
Ethical Leadership Phenomenon Based on Cultural Excellence	0.855
Main Strategies and Actions	0.559
Outcomes	0.833

Table 9 reports the R^2 values for the endogenous variables in the structural model. The highest R^2 was observed for the ethical leadership phenomenon based on cultural excellence (0.855), indicating that approximately 85.5% of the variance in this core construct is explained by the model. Outcomes ($R^2 = 0.833$) and contextual conditions ($R^2 = 0.825$) also showed strong explanatory power. Intervening conditions and strategies were explained moderately well, with R^2 values of 0.583 and 0.559, respectively. These findings collectively suggest that the structural model possesses high predictive accuracy and explains a substantial proportion of variance in key latent constructs related to ethical leadership.

Table 10. Hypothesis Testing Results

Hypothesis	Path Coefficient (β)	t-Statistic	Result
Causal conditions positively affect the phenomenon of ethical leadership based on cultural excellence.	0.497	11.671	Supported
Causal conditions positively affect the intervening conditions in the ethical leadership model.	0.541	22.952	Supported
Causal conditions positively affect the contextual conditions in the ethical leadership model.	0.350	2.761	Supported
Contextual conditions positively affect the phenomenon of ethical leadership based on cultural excellence.	0.613	32.965	Supported
Contextual conditions positively affect the strategies and actions of ethical leadership based on cultural excellence.	0.594	25.858	Supported

Contextual conditions positively affect the outcomes of ethical leadership based on cultural excellence.	0.560	23.893	Supported
Intervening conditions positively affect the phenomenon of ethical leadership based on cultural excellence.	0.656	45.075	Supported
Intervening conditions positively affect the strategies and actions of ethical leadership based on cultural excellence.	0.603	31.320	Supported
Intervening conditions positively affect the outcomes of ethical leadership based on cultural excellence.	0.650	41.271	Supported
The phenomenon of ethical leadership based on cultural excellence positively affects the strategies and actions.	0.644	43.766	Supported
The strategies and actions of ethical leadership based on cultural excellence positively affect the outcomes.	0.859	54.345	Supported

As presented in Table 10, all eleven hypothesized relationships in the structural model were confirmed with statistically significant path coefficients and high t-values, indicating strong support for the proposed theoretical framework. The most substantial effect was observed in the impact of strategies on outcomes (β = 0.859, t = 54.345), emphasizing the pivotal role of ethical leadership strategies in achieving desirable organizational consequences. Additionally, the effect of intervening conditions on the ethical leadership phenomenon (β = 0.656, t = 45.075) and on outcomes (β = 0.650, t = 41.271) were both notably strong, underscoring the importance of broader socio-cultural, individual, and operational factors in shaping ethical leadership outcomes. Even the weakest confirmed relationship—between causal conditions and contextual conditions (β = 0.350, t = 2.761)—remained statistically significant, suggesting a coherent and well-fitting structural model. These results collectively validate the integrative pathway from antecedent conditions through leadership strategies to final organizational outcomes within the context of culturally grounded ethical leadership in the petrochemical industry.

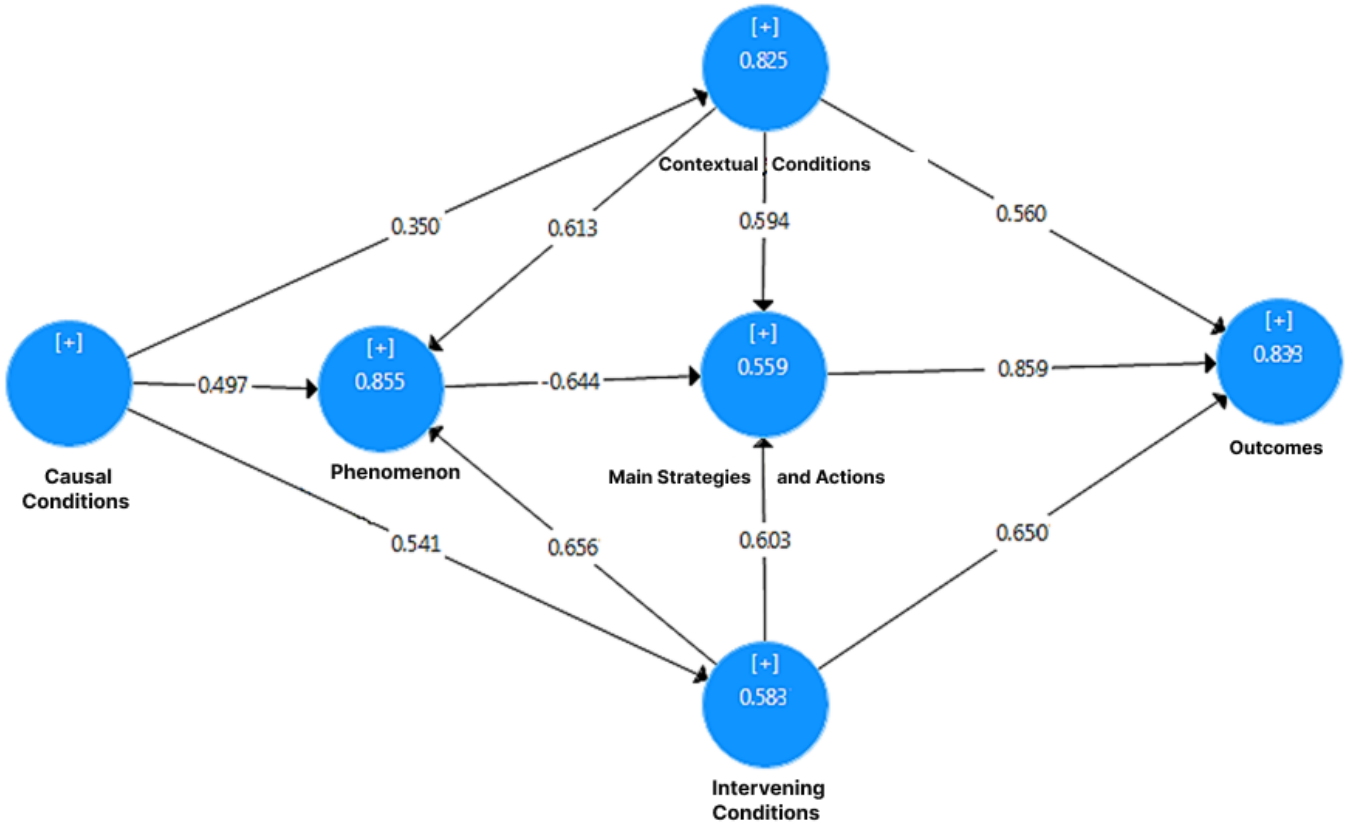

Figure 1. Model with Beta Values

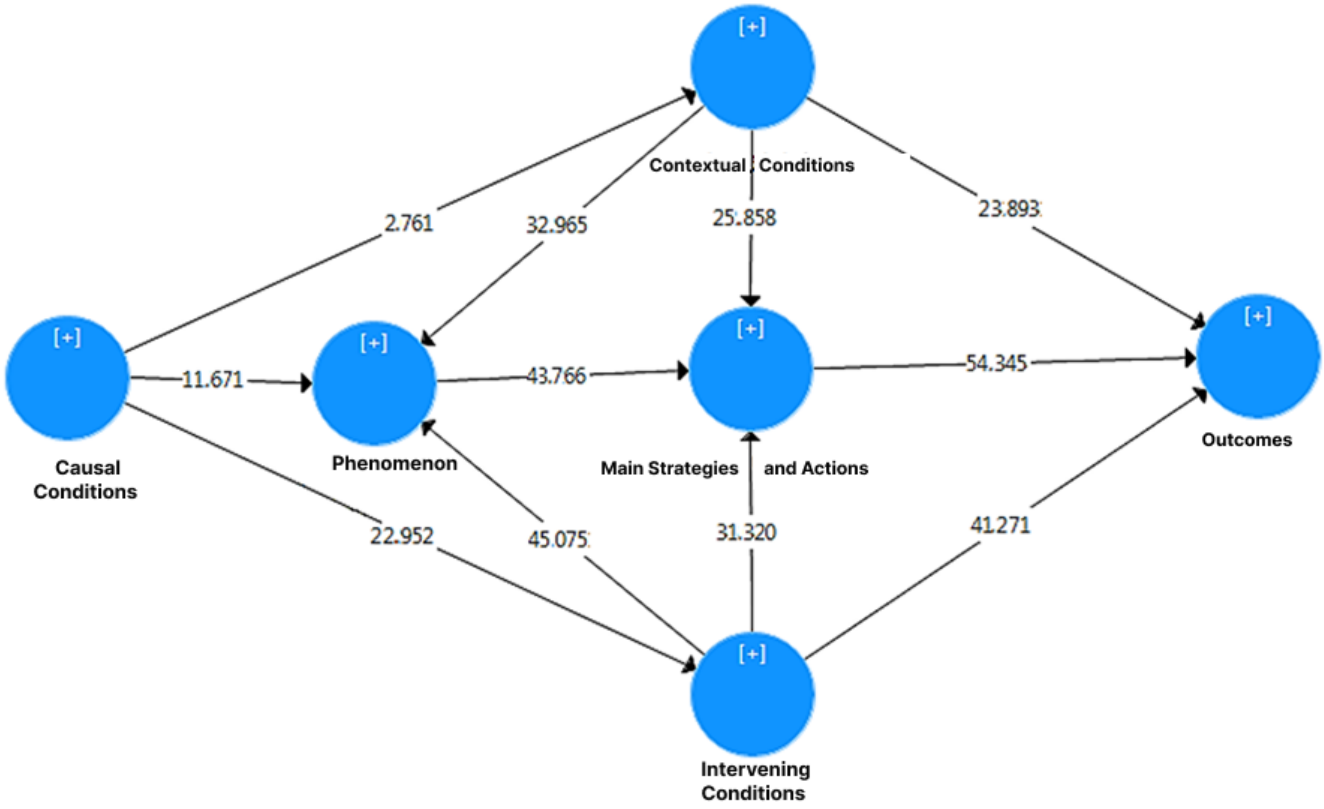

Figure 2. Model with T-Values

4. Discussion and Conclusion

The results of this study confirm the robustness and theoretical coherence of the proposed model of ethical leadership based on cultural excellence within the Iranian petrochemical industry. Using grounded theory followed by structural equation modeling, the research identified and validated six core dimensions: causal conditions, contextual conditions, intervening conditions, the ethical leadership phenomenon, strategic actions, and outcomes. Each hypothesized relationship in the structural model was statistically significant, suggesting strong interdependence among the dimensions and demonstrating the model's explanatory power in capturing the complex dynamics of ethical leadership in this sector. The highest path coefficient (β = 0.859) was found in the relationship between leadership strategies and organizational outcomes, affirming the critical role of applied leadership behaviors in achieving performance improvements. Similarly, the influence of contextual conditions (β = 0.825) and the ethical leadership phenomenon itself (β = 0.855) on various aspects of the model further supports the theoretical assumption that ethical leadership in culturally rich organizations emerges from and is reinforced by organizational structures, values, and environmental dynamics.

The positive and significant effect of causal conditions on the emergence of the ethical leadership phenomenon (β = 0.497, t = 11.671) aligns with the findings of (Ghanbari & Abdolmaleki, 2019), who demonstrated that ethical leadership behaviors are often triggered by employee disengagement, declining motivation, and reputational risks in highly technical sectors. The data also support the argument made by (Montakhab et al., 2016) that ethical leadership acts as a corrective force in response to organizational deviance and commitment erosion. In line with this, the subcategories such as reduced citizenship behaviors and the need for professional development found in the qualitative analysis correspond to antecedents identified in prior studies, where ethical leadership is seen as a strategic response to organizational and interpersonal deficits.

The strong relationship between contextual conditions and the ethical leadership phenomenon (β = 0.613, t = 32.965) corroborates literature emphasizing the centrality of organizational culture, communication systems, and structural design in shaping ethical behavior at the leadership level. As noted by (King et al., 2020), ethical leadership does not emerge in a vacuum; rather, it is cultivated through deliberate alignment of policies, values, and interpersonal systems. The qualitative data

revealed organizational hierarchy, transparency, and performance evaluation mechanisms as key enablers—findings that echo the work of (Carakos, 2018), who found that an ethical climate mediated the relationship between leadership and employee outcomes. This suggests that ethical leadership in this context is deeply embedded within institutional design and policy consistency.

Intervening conditions—such as individual differences, socio-cultural factors, and the economic climate—also significantly affected both the ethical leadership phenomenon (β = 0.656, t = 45.075) and the resultant leadership strategies (β = 0.603, t = 31.320). These findings align with (Ullah et al., 2022) and (Ullah et al., 2019), who emphasized the moderating role of ethical climate and intellectual capital in linking CEO ethical leadership to corporate responsibility. The present study extends their findings by demonstrating that contextual and personal variables not only moderate but also dynamically shape the strategic responses leaders implement. Factors such as individual ethical orientation, job characteristics, and national economic volatility proved central to understanding variations in leadership implementation, reinforcing the multidimensional nature of ethical leadership as argued by (Huff et al., 2023).

The model also demonstrated that contextual and intervening conditions had strong direct effects on leadership strategies and outcomes, indicating the mediating role of these conditions in translating ethical intent into practical behavior. For instance, contextual conditions had a path coefficient of 0.594 toward leadership strategies and 0.560 toward outcomes, which mirrors the findings of (Zahari et al., 2024), who stressed that ethical culture within public organizations mediates the impact of leadership on sustainable governance outcomes. Similarly, (Tamer, 2021) observed that cultural outcomes in healthcare organizations are heavily contingent on ethical leadership strategies embedded in operational processes. The strong empirical relationships found in this study between organizational structures and leadership implementation support the idea that ethical leadership must be both value-driven and institutionally grounded to generate lasting organizational change.

One of the most theoretically insightful findings relates to the relationship between the core ethical leadership phenomenon and its operationalization through strategic behaviors. The path coefficient of 0.644 and high t-value (43.766) validate earlier theoretical assumptions that ethical leadership is not only a matter of personal ethics but is manifested through participatory management, transparency, and value dissemination (Kim & Lee, 2024; Schwartz, 2013). These findings echo (Mohammadi Komroudi et al., 2024), who emphasized that ethical leadership in educational institutions must be enacted through systematic strategies such as training, feedback, and fair compensation. The subcategories identified in the qualitative data—like participatory decision-making, transparency promotion, and justice in evaluation—reinforce this view, indicating that leadership effectiveness depends on how ethical principles are translated into daily practice.

Furthermore, the final link in the model—between strategies and outcomes (β = 0.859, t = 54.345)—emphasizes the practical implications of ethical leadership. As (Karimi et al., 2013) and (Royayi Ramazani et al., 2012) noted, ethical leadership significantly improves audit quality and reduces counterproductive behaviors by reinforcing value congruence and clarity of role expectations. In the context of the petrochemical industry, the present study finds that such strategies lead to increased organizational performance, satisfaction, commitment, and sustainable leadership culture. These findings resonate with (Schwartz, 2013), who proposed that ethical corporate culture requires continuous reinforcement through consistent leadership behaviors and organizational alignment.

Together, the empirical results of this study validate the multidimensional, culturally grounded model of ethical leadership and highlight its operational relevance for high-impact industries like petrochemicals. The integration of grounded theory with structural modeling provides a strong methodological foundation for theory development while affirming the critical role of context, culture, and strategic action in ethical leadership efficacy.

Despite the theoretical and practical contributions, this study has certain limitations. First, the generalizability of findings is limited due to the focus on a single sector within a specific national context. The Iranian petrochemical industry has unique cultural, economic, and structural characteristics that may not translate directly to other industries or countries. Second, while the mixed-methods approach enriched the model development, the quantitative phase relied on self-reported data, which is susceptible to social desirability bias. Third, the cross-sectional nature of the data prevents causal inferences about the long-term effectiveness of ethical leadership practices.

Future research should consider comparative studies across different sectors—such as healthcare, education, or finance—to examine whether the culturally-excellence-based ethical leadership model holds in varying institutional contexts. Longitudinal studies are also recommended to assess the durability of leadership outcomes over time and explore the evolving nature of ethical leadership under changing external pressures. Additionally, further refinement of the model could benefit from incorporating variables such as digital leadership, generational diversity, or ESG metrics, thereby extending its relevance in the age of technological and environmental disruption.

Organizations aiming to cultivate ethical leadership rooted in cultural excellence should invest in designing leadership development programs that emphasize value congruence, cultural sensitivity, and participatory governance. Formal mechanisms—such as transparent evaluation systems, merit-based promotion criteria, and inclusive communication channels—should be institutionalized to translate ethical principles into actionable practices. Moreover, organizational leaders must actively model ethical behaviors and provide consistent reinforcement through policies, rewards, and feedback systems to institutionalize an ethical culture capable of enhancing long-term performance and social responsibility.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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