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Application of Grounded Theory for Developing an Investment Strategy in the Upstream Oil Industry under Sanctions

Iman. Mohammadi[1], Hossein. Adab[1*], Jalal. Haghighat Monfared [1]

[1] Department of Industrial Management, CT.C., Islamic Azad University, Tehran, Iran

*** Corresponding author email address**: Hos.Adab@iau.ac.ir

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A B S T R A C T

Part of the development of the oil industry requires technology, while another part depends on financing. The intensification of sanctions and international restrictions has had a significant impact on the process of selecting and proposing financing mechanisms. The purpose of this study is to develop an investment strategy in the upstream oil industry aligned with the approach of sustainable (conservation-oriented) production under sanction conditions. The research method is qualitative–quantitative. For data collection in the qualitative section, semi-structured interviews were used. The interviewees were experts employed in one of the active companies in the national oil industry, selected through purposive sampling. Among 14 interviewees, theoretical saturation was achieved with the tenth participant. Data analysis was conducted using grounded theory and, based on Strauss and Corbin's approach, the final model was developed. In this process, 26 concepts were identified from verbal statements, categorized into 5 themes. For the quantitative validation of the model, structural equation modeling (SEM) was employed. First, questionnaires were designed, and their validity and reliability were examined. Construct, content, convergent, and discriminant validity were confirmed, while reliability was assessed using Cronbach's alpha and composite reliability, all of which were verified. The questionnaires were then distributed among the statistical sample. The sample consisted of 135 managers and experts from the studied company. Based on the questionnaire data analysis, and given the non-normal distribution of data, the Partial Least Squares (PLS) method was applied using Smart PLS version 2 software. The research model was tested and confirmed. According to these analyses, the impact of causal conditions on the main phenomenon was 0.904, the impact of the main phenomenon on strategy was 0.579, the impact of contextual conditions on strategy was 0.756, the impact of intervening conditions on strategy was 0.628, and the impact of strategy on outcomes was 0.913.

Keywords: *Investment, Upstream Oil Industry, Sustainable Production, Sanction Conditions, Grounded Theory*

1. Introduction

The upstream oil industry, as the core of exploration and production activities, has always been one of the most strategic and politically sensitive sectors in the global economy. Investment decisions in this domain are shaped by multiple and interdependent factors, ranging from international legal regimes and contractual frameworks to geopolitical dynamics, technological capacities, and environmental concerns. In the context of Iran, which has historically relied heavily on hydrocarbon revenues, the significance of designing sustainable and resilient investment strategies in the upstream oil industry has become particularly urgent under the dual pressures of sanctions and the imperative of conservation-oriented production (Younesi, 2025).

The oil and gas sector is distinguished by complex contractual arrangements, many of which have been designed to balance the interests of host governments and international oil companies (IOCs). In Iran, various forms of contracts—including buy-back and the more recent Integrated Petroleum Contracts (IPCs)—have been used to attract capital and expertise while maintaining sovereign control over resources (Torabzadeh Jahrami et al., 2017). However, such contracts have faced criticisms in terms of risk allocation, return on investment, and compliance with evolving international legal obligations (Ghandi & Lin Lawell, 2017; Li et al., 2017). Comparative legal studies also highlight the growing importance of transnational law in shaping the effectiveness of both unilateral and multilateral sanctions, which have directly influenced the feasibility of long-term upstream projects (Alavi et al., 2025).

The intensification of U.S. secondary sanctions since 2018 has deeply disrupted Iran's upstream sector by restricting access to financing, technology transfer, and global partnerships (Razavi & Zein Al-Dini, 2018). While some efforts have been made to mitigate the risks of sanctions through alignment with European Union regulations and the adaptation of subsidiary strategies (Razavi & Salari, 2020), the sector continues to face challenges in securing stable investment flows. These restrictions highlight the need for innovative policy solutions, particularly in balancing national sovereignty with international cooperation (Fazel et al., 2020). At the same time, the contractual and legal framework must incorporate evolving mechanisms such as smart contracts, which have emerged as an efficient instrument in the governance of oil, gas, and petrochemical investments (Mohammadi, 2023).

Globally, the dynamics of the oil market are increasingly influenced by OPEC's policies and the strategic use of spare capacity as a tool for market stability. OPEC's ability to adjust production levels provides significant value to both the oil market and the wider global economy (Pierru et al., 2021). However, the interplay of OPEC with non-OPEC producers and the rise of new supply sources have complicated traditional assumptions regarding supply security and pricing (Hamilton et al., 2021). For Iran, these dynamics create both opportunities and threats: while market shifts may open niches for alternative trade strategies, sanctions and limited access to advanced technologies continue to constrain capacity expansion (Artemkina et al., 2019).

The evolution of upstream investment strategies in mature regions demonstrates that portfolio diversification, integration of new financial instruments, and improved project management are central to maintaining competitiveness (Artemkina et al., 2019). International experience shows that project finance has become the backbone of large-scale petroleum investments, enabling risk-sharing and the mobilization of capital across borders (Clews, 2016). However, Iran's upstream projects have traditionally relied on state financing, which under conditions of budgetary limitations and sanctions, is increasingly unsustainable. Scholars argue that without a transformation in financing strategies and the adoption of more flexible models, Iran risks falling behind in both production capacity and technological advancement (Dehghani, 2019).

The literature also emphasizes that oil and gas investments are highly sensitive to fluctuations in crude prices, which significantly influence the willingness of OPEC members to commit capital to upstream projects (Jalalifar & Babaei, 2016). Volatility in international markets, combined with domestic structural inefficiencies, amplifies the risks of investment cycles in countries like Iran (Hosseini et al., 2016). Moreover, the global transition toward renewable energy and net-zero targets has added further uncertainty to the long-term prospects of oil-centered economies. National oil companies (NOCs), which historically have served as instruments of state policy, are now challenged to adapt to decarbonization strategies while ensuring continuity of revenues (Yates, 2021).

Against this backdrop, Iranian policymakers face the dual challenge of defending against sanction-induced disruptions while pursuing reforms that enhance investment attractiveness. Scholars have argued that successful

navigation of this environment requires legal, economic, and technological innovation. On the legal side, careful reconfiguration of contractual frameworks is necessary to ensure compliance with international law and attract foreign partners (Kazemi Najaf Abadi & Ghafari, 2017). Economically, attention must be directed toward creating a favorable investment climate by reducing risks, diversifying financing options, and strengthening resilience against external shocks (Bandarian, 2022). Technologically, investment in knowledge management and innovation ecosystems is critical to achieving self-sufficiency in exploration and production processes (Ghasemi & ValMohammadi, 2018).

The role of technology has been highlighted as a key determinant in shaping the business models of global oil players. Studies show that access to advanced exploration and extraction technologies enables companies to enhance efficiency and reduce exposure to geopolitical risks (Ebneyamini & Bandarian, 2019). In this sense, Iran's heavy dependence on external technology represents a strategic vulnerability. To mitigate this, policies should focus not only on fostering domestic innovation but also on leveraging international partnerships that remain insulated from sanction pressures (Xu et al., 2021). At the same time, the application of big data analytics and business intelligence tools is transforming how investment decisions are made in the energy sector (Vidgen et al., 2017). For oil-dependent economies, integrating these analytical capabilities into upstream investment strategies can enhance forecasting, reduce uncertainty, and optimize resource allocation.

Strategic foresight and scenario planning are also increasingly critical in conditions of energy instability. The shift in the essence and role of strategic planning, particularly in volatile markets, underscores the importance of adaptive and flexible approaches (Ilinova & Solovyova, 2021). In this respect, upstream investment strategies should not only focus on maximizing current revenues but also anticipate long-term shifts in energy demand, environmental regulations, and technological transitions. Studies indicate that countries which adopt systematic approaches to policy design and organizational reform are better equipped to handle such transitions (Jalili et al., 2019; Kazemi Nejad et al., 2019).

The Iranian case further demonstrates how historical legacies and institutional challenges shape investment performance. Analyses of the business environment of international versus national oil companies reveal significant structural and cultural gaps, particularly in governance and competitive advantage (Bandarian et al., 2020). Without addressing these gaps, Iran's ability to compete in the global energy market will remain limited. Institutional reforms, especially in terms of transparency and accountability, are therefore indispensable to attract both domestic and international investors.

From an economic and legal perspective, unilateral sanctions have had markedly different implications compared to Security Council–mandated sanctions. While the latter carry broader international legitimacy, unilateral sanctions have been criticized for their disproportionate impact on host country economies and their questionable alignment with international law (Alavi et al., 2025). This legal complexity adds another layer of uncertainty for investors evaluating long-term commitments in sanctioned states. For Iran, developing strategies that reduce vulnerability to such unilateral measures is crucial not only for sustaining upstream investment but also for asserting economic sovereignty (Younesi, 2025).

Regional and domestic considerations also play a significant role. The Iranian petroleum contract model, for example, has been subject to economic analyses that reveal both strengths and weaknesses in incentivizing foreign participation (Fazel et al., 2020). Comparative studies of contract efficiency in condensate gas reservoirs further illustrate that contract design directly affects profitability and investment risk-sharing (Kazemi Najaf Abadi & Ghafari, 2017). Moreover, the shift toward conservation-oriented production highlights the importance of embedding sustainability principles in contractual and operational frameworks (Younesi, 2025).

Ultimately, the question of investment in Iran's upstream oil sector cannot be separated from broader geopolitical and economic transformations. Globalization has altered the structure of competition in the oil industry, as key players reposition themselves according to access to financial, technological, and human capital resources (Bandarian, 2022). At the same time, the emergence of new actors in energy markets and the ongoing digital revolution underscore the complexity of managing upstream investments in an era of systemic change (Jamil, 2024). As some scholars argue, achieving resilience in such an environment requires both structural adaptation at the organizational level and strategic alignment with macro-level policy frameworks (Gholipour & Eftekhari, 2016; Haghighi Kafash et al., 2016). The purpose of this study is to develop an investment strategy in the upstream oil industry aligned with the approach of sustainable

(conservation-oriented) production under sanction conditions.

2. Methods and Materials

The present study is a mixed-method (qualitative–quantitative) research. In terms of certainty of information, it is classified as exploratory research, and from the perspective of purpose, it falls within applied research. Given the exploratory nature of the study, for the modeling process (which is oriented toward theory-building rather than theory-testing), the grounded theory method was employed.

Open coding began after the interviews were conducted and through repeated readings of the interview transcripts until a general understanding of the interviews was achieved. In axial coding, concepts were grouped based on similarities or semantic equivalence. In selective coding, the main variable or the core process underlying the data, its mechanisms, stages of occurrence, and consequences were mapped (Haghighi et al., 2017). For classifying the data, open, axial, and selective coding were applied (Aghazadeh et al., 2019). All these procedures were framed within causal, intervening, and contextual conditions, the central phenomenon, strategies, and consequences, in order to present a resilient production model in line with the systematic approach of grounded theory by Strauss and Corbin (1998). This research method is not derived from pre-existing data but is instead developed or conceptualized from data obtained through interviews with participants who have experienced the process under study. Regarding sample size, it is appropriate not to determine a fixed number in advance; rather, the principle of theoretical saturation should guide the determination of the number of participants. In the present study, qualitative data were collected through semi-structured, purposive, exploratory, and participatory interviews with experts. Purposive sampling continued until theoretical saturation was achieved. The interviewees were managers and experts of a reputable company active in the oil industry, with at least 15 years of expertise in this field and holding a minimum of a master's degree. In this process, 14 interviews were conducted, with theoretical saturation achieved after the 10th interview, although interviews continued up to the 14th participant.

3. Findings and Results

In open coding, concepts and categories are identified, and their properties and dimensions are extracted from the data. This is presented in Table 1.

Table 1

Open Coding

Open Codes (Concepts)	Verbal Statements of Interviewees	Row
Oil market situation and size	The conditions of sales and the OPEC market are highly important in the type of investment. Likewise, the number of buyers and sellers in the market are influential factors in oil investment. Relationships with buyers can also affect resource conservation and coping with sanctions.	1
Sufficient knowledge of sanction conditions	Generally, attention to political issues and international barriers has created challenges in all industries, especially in the oil industry. Similarly, in the field of oil industry investment, these issues must be fully anticipated. Knowledge and experience in managing them, as well as using the experiences of other countries and companies, can play a vital role in upstream oil investment.	2
Global economic conditions	Oil-exporting countries, either due to excessive divergence of goals, differing defined interests, or specific political and economic conditions, often lack the ability or even the willingness to change prices. Overall, these external factors are drivers of such changes. From a problem-solving and policy-making perspective, it seems necessary for oil-exporting countries to redefine and reanalyze the issue to turn opportunities in favor of national interests. In particular, financial management of the national economy and maintaining independence from unpredictable and uncontrollable factors are critical.	3
International political developments	There is now a consensus among global oil market players that the old assumption of a direct correlation between oil prices and Middle East developments no longer holds as before. The global energy market now has a more precise understanding of risks related to energy infrastructure rather than purely political risks. Meanwhile, confidence in supply availability from new sources such as non-OPEC countries and North America helps maintain price stability.	4
Instability in decision-making consistency	One of the factors influencing investment in the upstream oil sector and creating difficulties in sanction resistance and political relations is contradictory decision-making among officials. Instability and frequent changes in decisions—some acceptable and some not—create barriers in oil-related investment decisions.	5
Exchange rate fluctuations	In Iran's economy, there have always been asymmetric effects of oil prices on macroeconomic variables, especially exchange rate indicators. This stems from the excessive dependence of the economy on foreign exchange revenues from oil exports. Consequently, oil shocks have been a significant source of instability for many economic indicators, which, if continued, can trigger currency crises.	6
Impact of sanctions on oil investment	Sanctions were imposed to prevent investment in the country. In fact, they were designed to hinder development by blocking investment, technology transfer, and the import of advanced equipment. None of these goals have been successfully countered. Nevertheless, sanctions have created major disruptions in upstream oil investment.	7

Oil reservoir management and conservation	With gradual extraction from reservoirs, reservoir pressure decreases in proportion to the withdrawal rate. As pressure declines, production from existing wells naturally decreases until natural production becomes impossible. At this point, reservoir pressure reaches fracture pressure. Unfortunately, lack of knowledge in reservoir management in the past created significant challenges for production. For instance, within a few years, the output of an oil well decreased by several thousand barrels. While conservation measures should start at the onset of extraction, decisions made during production can also help prevent premature depletion.	8
Estimation of oil in place	The amount of oil present in wells and its extraction status can influence upstream oil investment decisions.	9
Enhancing deterrence capability	The type of investment in the oil industry, especially in the upstream sector, which requires substantial costs, is an issue that can strengthen deterrence against other countries.	10
Drafting laws and regulations aligned with sanction conditions	New laws and regulations should be defined and issued at the governmental and parliamentary levels to counter oil sanctions.	11
Assigning upstream contracts to successful Iranian companies	According to oil sector regulations, to maximize the use of national research, design, technical, engineering, production, industrial, and executive capacities, the Ministry of Oil and its subsidiaries must utilize domestic companies with sufficient capabilities.	12
Designing contract duration consistent with field lifetime	The duration of investment in wells should not exceed the lifespan of oil fields, as excessive use can reduce pressure in other fields and complicate extraction.	13
Negotiation with foreign companies unaffected by sanctions	By drawing on the experiences of foreign companies that have faced sanctions and managed to withstand them, resources can be more effectively utilized.	14
Adoption of appropriate technology transfer methods	Using suitable methods of technology transfer, along with parallel technology learning, improves investment and reduces dependency on foreign companies and countries.	15
Conservation and compliance with environmental requirements	Attention to environmental requirements and aspects of sustainable development supports investment efforts.	16
Complexity of relations with state-owned companies	Due to rigid and sometimes contradictory regulations, interactions with state-owned companies—and even among such companies themselves—have become complicated.	17
Effective supervision by regulatory bodies	Oversight by regulatory bodies can lead to more precise and suitable investment in the energy sector.	18
Domestic financing	Domestic financing and appropriate investment strategies are mutually reinforcing.	19
Involvement of oil and gas beneficiary companies in investment processes	With appropriate investment strategies, all companies involved in the sector can benefit.	20
Flexibility aligned with oil price fluctuations	Considering different components of investment strategy in the oil industry can help align with exchange rate fluctuations and increase the country's oil revenues.	21
Establishment of transactions	Proper investments can facilitate favorable transactions.	22
Creation of investment stability for stakeholders	Proper investment ensures stability for all stakeholders in the oil and gas industry.	23
Empowering domestic companies and equipment manufacturers in the oil and gas industry	Proper investment strategies can support the presence and empowerment of domestic companies in the oil industry.	24
Modeling and expanding investment types in various fields	Different forms of upstream oil investment can be considered in terms of efficiency, production time, extraction methods, and similar factors, ultimately creating a basic strategy model that can serve as a general framework.	25
Enhancement and increase of production capacity	Investment approaches in the oil industry can lead to greater production capacity.	26

Axial Coding according to Table 2:

Table 2

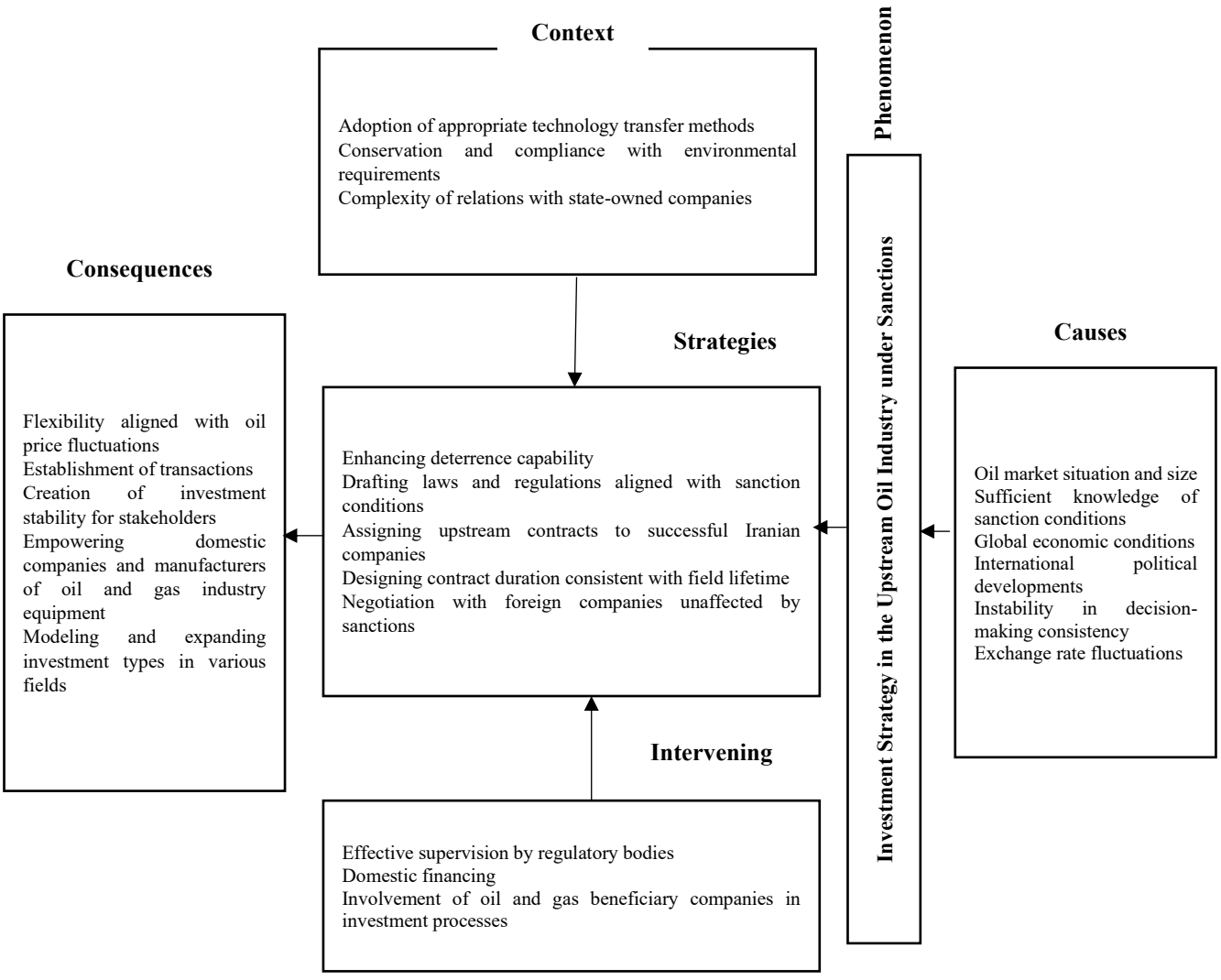
Axial Coding

Axes	Concepts	Row
Causal	Oil market situation and size	1
	Sufficient knowledge of sanction conditions	2
	Global economic conditions	3
	International political developments	4
	Instability in decision-making consistency	5
	Exchange rate fluctuations	6
Phenomenon	Impact of sanctions on oil investment	7
	Oil reservoir management and conservation	8
	Estimation of oil in place	9
Strategy	Enhancing deterrence capability	10

	Drafting laws and regulations aligned with sanction conditions	11
	Assigning upstream contracts to successful Iranian companies	12
	Designing contract duration consistent with field lifetime	13
	Negotiation with foreign companies unaffected by sanctions	14
Contextual	Adoption of appropriate technology transfer methods	15
	Conservation and compliance with environmental requirements	16
	Complexity of relations with state-owned companies	17
Intervening/Facilitating	Effective supervision by regulatory bodies	18
	Domestic financing	19
	Involvement of oil and gas beneficiary companies in investment processes	20
Consequence	Flexibility aligned with oil price fluctuations	21
	Establishment of transactions	22
	Creation of investment stability for stakeholders	23
	Empowering domestic companies and manufacturers of oil and gas industry equipment	24
	Modeling and expanding investment types in various fields	25
	Enhancement and increase of production capacity	26

Figure 1

Final Research Model



Ultimately, based on axial and selective coding conducted simultaneously, the final research model was developed in the form of Figure 1.

To validate the model quantitatively, the technique of structural equation modeling (SEM) was used. In this regard, the statistical population consisted of managers and experts of one of the active companies in the national oil industry, with a total of 135 participants. Accordingly, a census was conducted and the questionnaire was distributed among all individuals. For questionnaire validity, expert opinions were employed, and minor modifications were applied. Subsequently, discriminant validity (Table 3) and convergent validity (Table 4) were assessed, both of which were confirmed.

To assess reliability, Cronbach's alpha was used (Table 4), and results confirmed reliability. For discriminant validity, the diagonal values must be greater than the numbers on the right and below. For convergent validity, the values of the Average Variance Extracted (AVE) must be greater than 0.5, and for reliability, Cronbach's alpha must exceed 0.7.

Table 3

Discriminant Validity

Factors	Causal	Contextual	Phenomenon	Facilitator	Strategy	Consequence
Causal	0.79					
Contextual	0.41	0.84				
Phenomenon	0.23	0.46	0.82			
Facilitator	0.37	0.36	0.38	0.81		
Strategy	0.29	0.23	0.25	0.33	0.75	
Consequence	0.41	0.23	0.30	0.24	0.25	0.73

Table 4

Cronbach's Alpha and Convergent Validity

Factor	Cronbach's Alpha	AVE
Causal Conditions	0.721	0.674
Main Phenomenon	0.736	0.691
Contextual Conditions	0.715	0.622
Intervening/Facilitating Conditions	0.769	0.654
Strategic Action	0.759	0.632
Consequence	0.811	0.661

For assessing the distribution of variables and selecting the appropriate statistical method, the Kolmogorov–Smirnov test was applied (Table 5). Since significance levels were less than 0.05, the data distribution was non-normal. Accordingly, the Partial Least Squares (PLS) method was used to test the relationships among variables.

Table 5

Normality Test

Variable	Significance Level	Result
Causal Conditions	0.000	Non-normal
Main Phenomenon	0.000	Non-normal
Contextual Conditions	0.000	Non-normal
Intervening/Facilitating Conditions	0.000	Non-normal
Strategic Action	0.000	Non-normal
Consequence	0.000	Non-normal

The Partial Least Squares model was presented in two forms: significance values and standardized estimation coefficients (Figures 2 and 3).

Figure 2

Model of Significance Values

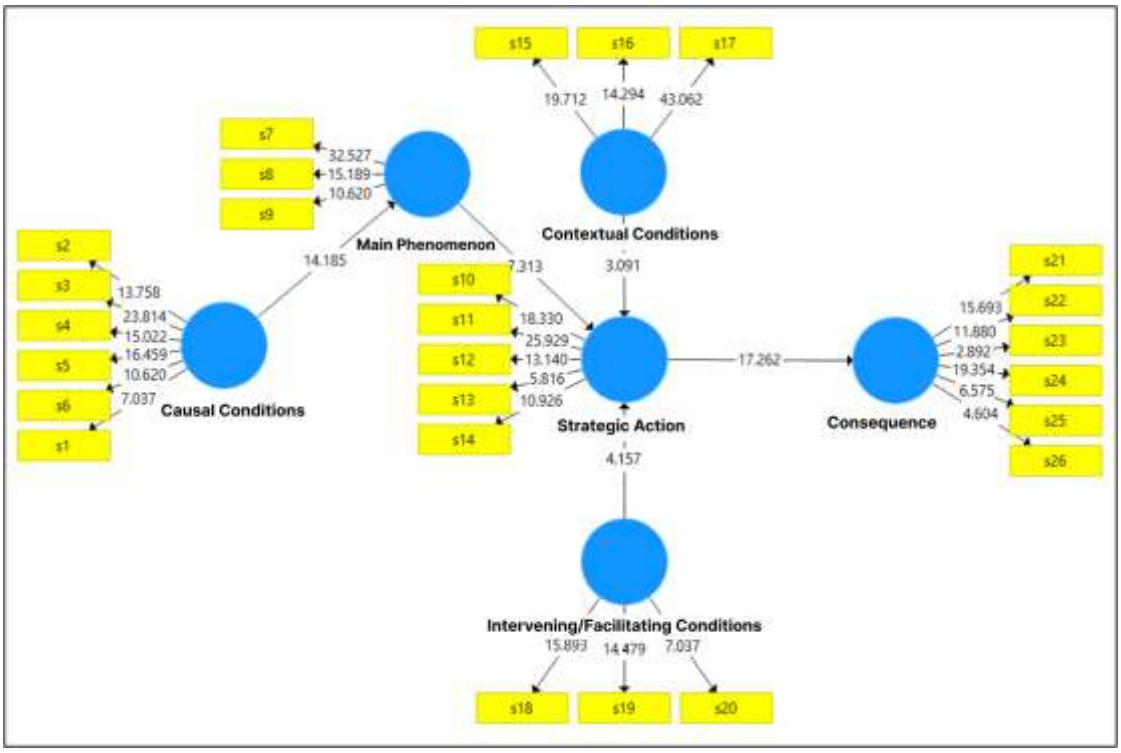


Figure 3

Model of Standard Estimation Coefficients

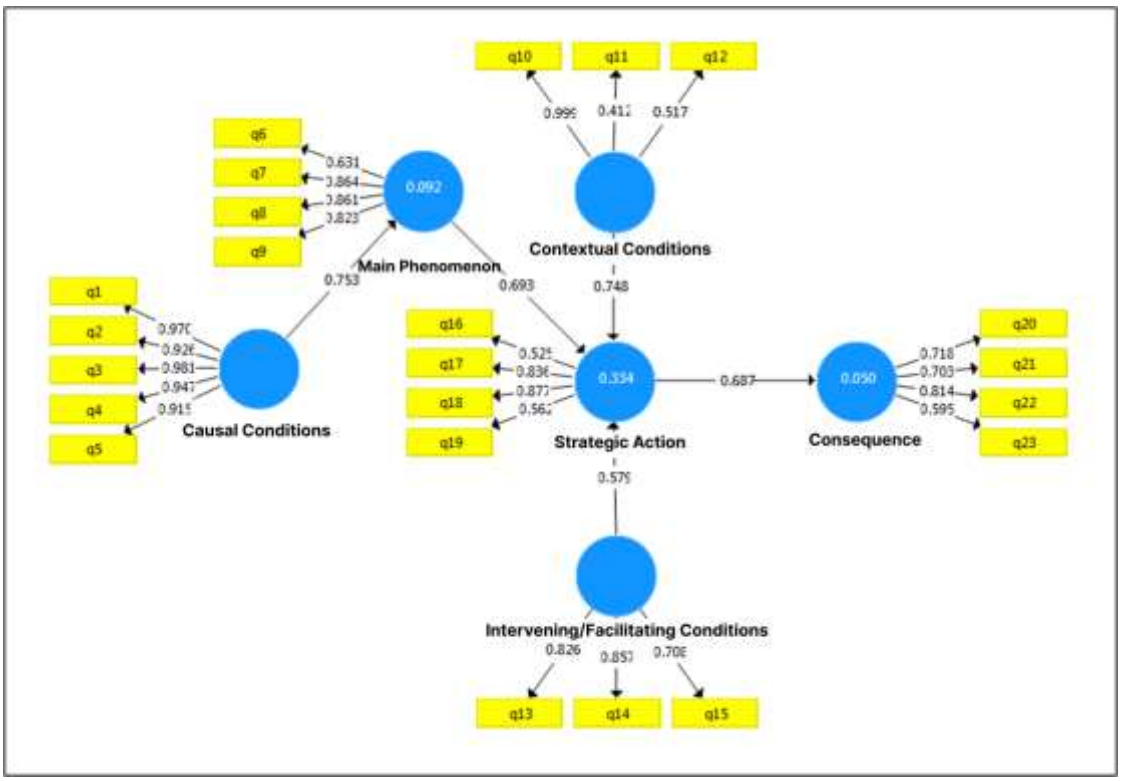


Table 6

Summary of Significance Values and Standardized Estimates

Effect	Significance	Standardized Coefficient	Result
Causal Conditions → Main Phenomenon	4.006	0.508	Confirmed
Main Phenomenon → Strategy	3.557	0.659	Confirmed
Contextual Conditions → Strategy	2.567	0.856	Confirmed
Intervening Conditions → Strategy	8.607	0.724	Confirmed
Strategy → Consequence	4.752	0.733	Confirmed

It is observed that all significance values are greater than 1.96 (Figure 2), and the standardized coefficients (factor loadings) are also greater than 0.4 (Figure 3). Therefore, the research model is validated and considered reliable.

The Goodness of Fit (GOF) criterion was 0.528, which is greater than 0.36, confirming the model's fit. Thus, the final model is confirmed quantitatively.

4. Discussion and Conclusion

The findings of this study provide a systematic and empirically validated model for understanding the dynamics of investment strategies in Iran's upstream oil sector under sanction conditions. The grounded theory approach, combined with structural equation modeling, revealed that causal conditions such as fluctuations in global markets, political instability, and sanctions exerted a direct and strong influence on the main phenomenon—namely, the disruption and restructuring of oil investment strategies. This finding is consistent with the literature emphasizing that the oil and gas sector is highly vulnerable to external political and economic pressures, especially in countries subject to international sanctions (Razavi & Salari, 2020; Razavi & Zein Al-Dini, 2018).

The quantitative validation confirmed that causal conditions exerted the highest impact on the central phenomenon, with a coefficient above 0.9. This demonstrates that political sanctions, global oil price volatility, and decision-making inconsistencies significantly shape the investment environment. Previous studies also point to the central role of sanctions in obstructing investment flows, both by restricting access to financial markets and by discouraging foreign firms from participating in upstream contracts (Alavi et al., 2025; Fazel et al., 2020). Moreover, the results align with scholarship that highlights the inefficiency of unilateral sanctions compared to Security Council–mandated sanctions, in terms of both their legal legitimacy and their practical impact on host countries (Alavi et al., 2025).

Another major result concerns the effect of the main phenomenon on strategies, with a coefficient of 0.579. This suggests that although the presence of sanctions and related disruptions have constrained investment, firms and policymakers have developed adaptive strategies to mitigate the impacts. These strategies include enhancing deterrence capability, revising contract durations, and negotiating with non-sanctioned foreign companies. This aligns with evidence that the Iranian petroleum contract model, despite its limitations, provides some economic opportunities when adapted to new conditions (Fazel et al., 2020). Furthermore, comparative research has shown that different forms of upstream contracts, such as buy-back and IPC frameworks, vary significantly in their ability to distribute risk and ensure profitability (Ghandi & Lin Lawell, 2017; Kazemi Najaf Abadi & Ghafari, 2017; Li et al., 2017).

The results also revealed that contextual conditions such as technology transfer, environmental requirements, and relations with state-owned enterprises have a significant effect on the development of strategies, with a coefficient of 0.756. This underscores the importance of institutional and organizational structures in shaping investment outcomes. Previous studies similarly emphasize that upstream oil investment is not solely a matter of capital inflow but also depends heavily on governance quality, transparency, and the capacity for technology absorption (Bandarian et al., 2020; Jalili et al., 2019; Kazemi Nejad et al., 2019). For example, the role of technology in shaping business models of oil companies has been demonstrated at the global level, where access to advanced extraction and data analytics tools enhances both efficiency and competitiveness (Ebneyamini & Bandarian, 2019; Vidgen et al., 2017; Xu et al., 2021).

Intervening conditions, particularly regulatory oversight and domestic financing, also demonstrated strong positive effects on strategy, with a coefficient of 0.628. These findings reinforce the notion that resilient financing mechanisms and effective regulatory frameworks can offset external shocks. For instance, project finance models have been critical in international petroleum investment, offering

avenues for risk-sharing across stakeholders (Clews, 2016). Yet, Iran has historically struggled with over-reliance on state financing, making the exploration of domestic financing strategies an essential adaptation (Dehghani, 2019). Additionally, international analyses have pointed out the transformative role of national oil companies (NOCs) in adapting investment pathways toward sustainability and resilience in the face of net-zero goals (Yates, 2021).

The strongest effect in the model was observed between strategy and outcomes, with a coefficient of 0.913. This demonstrates that carefully designed strategies not only mitigate risks but also generate substantial positive outcomes, such as stability for stakeholders, enhanced deterrence, and improved production capacity. Previous empirical studies confirm that successful implementation of strategic investment frameworks can transform vulnerabilities into opportunities, particularly when contract design is aligned with the realities of sanctions and market volatility (Hosseini et al., 2016; Jalalifar & Babaei, 2016; Torabzadeh Jahrami et al., 2017). Furthermore, research on mature regions shows that investment portfolio diversification and flexible contract durations contribute to more sustainable outcomes (Artemkina et al., 2019).

A notable implication of these results is the central role of knowledge management and innovation in sustaining upstream investment. The literature suggests that organizations capable of embedding systematic knowledge management processes are better equipped to manage complexity and uncertainty (Ghasemi & ValMohammadi, 2018). Moreover, strategic foresight and adaptive planning have been shown to play a decisive role in contexts of energy instability (Ilinova & Solovyova, 2021). The findings of the present study support these claims, as contextual and intervening conditions related to institutional innovation significantly influenced investment strategies.

Another important aspect is the geopolitical and economic interdependence that characterizes the oil market. The results show that global economic and political conditions are deeply intertwined with local investment decisions. This aligns with international analyses highlighting the strategic value of OPEC's spare capacity to global economic stability (Hamilton et al., 2021; Pierru et al., 2021). Similarly, historical analyses of the global oil business point to the centrality of major players and their ability to adapt to changing pillars of competition (Bandarian, 2022). For Iran, this highlights the importance of aligning upstream strategies with both domestic resilience and global market shifts.

The study also illustrates how the challenges of sanctions can catalyze institutional reforms. By emphasizing the role of domestic financing and regulatory oversight, the findings resonate with arguments that institutional innovation is essential for competitive advantage (Bandarian et al., 2020). Furthermore, the integration of legal mechanisms such as smart contracts represents an opportunity for greater transparency and efficiency in oil investments (Mohammadi, 2023). Studies suggest that when such mechanisms are embedded in contractual frameworks, they reduce transaction costs and mitigate some of the uncertainties created by sanctions and political instability.

Overall, the findings contribute to the broader literature by confirming that upstream oil investment strategies in sanction-affected economies are best understood through a multi-level lens, incorporating causal, contextual, and intervening conditions. The model validated in this study provides both a theoretical and practical framework for policymakers and industry stakeholders. By integrating causal drivers, contextual enablers, and strategic responses, the model echoes earlier calls for a comprehensive approach to energy sector planning (Gholipour & Eftekhari, 2016; Haghighi Kafash et al., 2016). Moreover, it highlights the necessity of embedding environmental and sustainability considerations into upstream strategies, a trend increasingly recognized in global energy governance (Yates, 2021; Younesi, 2025).

This research, while comprehensive in its qualitative–quantitative design, has several limitations. First, the study focused on a single company within Iran's upstream oil sector, which may limit the generalizability of the findings across the wider industry. The purposive sampling of experts, although methodologically justified, introduces potential biases linked to the experiences and perspectives of the selected participants. Second, the use of structural equation modeling with a sample size of 135 participants, while robust, may constrain the statistical power of detecting more nuanced relationships among variables. Third, the study was conducted under conditions of active sanctions, meaning that the responses and strategies identified may be shaped more by short-term crisis management rather than long-term structural reforms. Finally, the model did not incorporate environmental shocks such as global pandemics or climate change policies, both of which could exert significant effects on investment strategies in the future.

Future research should expand the scope of inquiry by incorporating multiple companies across different segments of the oil and gas value chain, allowing for a more

representative analysis of the Iranian industry. Comparative studies with other sanction-affected countries, such as Venezuela or Russia, could also enrich understanding of how similar pressures manifest under different institutional contexts. Methodologically, longitudinal designs could capture how investment strategies evolve over time as sanction regimes intensify, relax, or transform. Additionally, integrating environmental and climate-related variables into future models would enhance the applicability of findings to a world increasingly shaped by decarbonization pressures. Finally, mixed-method studies that combine grounded theory with advanced simulation models could provide deeper insights into the dynamic interactions among political, economic, and technological factors.

From a practical perspective, the results emphasize the urgent need for Iranian policymakers and industry stakeholders to strengthen institutional frameworks that promote resilience in upstream investments. Companies should prioritize diversification of financing sources, including domestic capital markets and partnerships with non-sanctioned international firms. Contractual frameworks should be revised to better allocate risks, ensure flexibility in investment horizons, and integrate technological innovation such as digital contracts and data analytics. Regulators must improve transparency and accountability mechanisms to build investor confidence. Moreover, embedding environmental and sustainability criteria into upstream strategies will not only improve international legitimacy but also enhance long-term competitiveness. By operationalizing these insights, Iran can transform its upstream sector from a vulnerability point into a platform for resilience and innovation.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were considered.

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