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Key Success Factors in Technology Acquisition in Iran's Oil and Gas Industries Through Multinational Corporations

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Abstract

Research indicates that, despite numerous opportunities for knowledge acquisition and learning within the framework of contracts concluded with foreign oil companies, these companies have not played an active role in transferring technical knowledge and skills or in developing specialized human resources. The considerable complexities associated with technology, on the one hand, and differences in the views and approaches of the responsible authorities, on the other, have further contributed to the lack of success in this area. The fundamental question is why, despite more than a century of experience and several decades of active involvement by oil companies in Iran, the country has still been unable to satisfactorily address its deficiencies in technical knowledge and managerial capabilities. This study therefore seeks to answer the following question: What factors influence the success of an international technology transfer project in the oil industry through multinational corporations, and through what mechanisms do these effects occur? Accordingly, this article first classifies the key (critical) success factors in technology transfer, extracted from previous studies and interviews through thematic analysis, into four general categories: factors related to the technology provider, the technology recipient, the cooperation context, and the nature of the technology. Subsequently, technology transfer projects involving Tatneft, Statoil, and Lurgi were examined as case studies of technology transfer to Iran. Purposive and snowball sampling methods were used to identify and select experts. Through interviews with 11 experts who had participated in the aforementioned projects, 30 factors were identified by coding the interview data using thematic analysis. These factors formed the basis of the questionnaires administered in the second and third rounds. Using the Delphi method, 10 factors that achieved agreement among more than 70% of the experts were identified as the key success factors in technology acquisition. These factors were incorporated into the model developed by the study. Drawing on this model and the study findings, recommendations can be formulated for strengthening the technology development and innovation system in Iran's oil industry.

Keywords: Technology transfer, multinational corporations, key success factors, technology transfer policies, technology spillover, technological collaboration

1. Introduction

Technology has become one of the most consequential strategic resources for organizations and national economies seeking to sustain competitiveness, improve productivity, and develop higher-value capabilities. In industries characterized by high capital intensity, technological complexity, long investment horizons, and substantial operational risk, competitive advantage

increasingly depends not merely on access to physical assets but on the capacity to acquire, assimilate, adapt, and exploit advanced technological knowledge. The oil and gas industry exemplifies this condition because exploration, reservoir management, drilling, refining, petrochemicals, enhanced recovery, process engineering, and environmental management all require continuously evolving combinations of scientific knowledge, engineering expertise, organizational routines, software, equipment, and tacit experience. Consequently, developing countries with significant hydrocarbon resources frequently regard international technology transfer as a mechanism for narrowing technological gaps and accelerating domestic capability formation. At the organizational level, this process increasingly occurs through networks in which multinational corporations possess a central position because they control extensive technological assets, international managerial experience, intellectual capital, global supply chains, and cross-border knowledge infrastructures. Contemporary studies of multinational corporations demonstrate that knowledge management, data-driven decision systems, and the integration of distributed organizational resources are increasingly central to their competitiveness and operational resilience (Gao, 2026). At the same time, the growing internationalization of corporate activities has made the management of knowledge, human resources, organizational practices, and technology across institutional boundaries progressively more complex (Haiqiu et al., 2024).

Multinational corporations are particularly important channels through which technologies, managerial practices, organizational routines, and specialized expertise move across national borders. Their international operations connect subsidiaries, suppliers, research centers, contractors, host-country organizations, and other institutional actors, potentially creating opportunities for knowledge diffusion and technological spillovers. However, the presence of a multinational corporation in a host economy does not automatically result in meaningful technology acquisition. International operations are shaped by corporate strategy, competitive interests, localization requirements, contractual arrangements, institutional constraints, cultural differences, and the absorptive capacity of local partners. Research on innovation in multinational enterprises suggests that the capacity of such firms to introduce and disseminate innovation is strongly associated with the organizational and institutional conditions under which they operate (Efimenko, 2024). Similarly, studies of multinational organizational structures indicate that autonomy, role clarity, and the distribution of decision-making authority can significantly affect organizational functioning in developing-country contexts (Zaheer et al., 2024). Therefore, technology transfer should be conceptualized not as a simple transaction through which machinery or technical documentation changes hands, but as a multidimensional organizational process in which technological knowledge must be communicated, learned, interpreted, internalized, and ultimately transformed into independent operational capability.

The strategic behavior of multinational corporations further complicates this process. These firms simultaneously pursue global integration, cost efficiency, market access, protection of proprietary knowledge, regulatory compliance, and local responsiveness. Their decisions concerning the location and transfer of intangible assets, operational knowledge, and organizational capabilities are consequently influenced by both competitive and institutional considerations. Studies of multinational transfer-pricing and offshore strategies demonstrate how multinational enterprises configure cross-border activities strategically in response to economic incentives and competitive conditions (Yuan et al., 2025). Research on intangible assets likewise illustrates the strategic importance of knowledge-based resources within multinational corporate structures (Li, 2024). Financial, regulatory, and governance considerations may also affect multinational behavior, as evidenced by research addressing financial reporting quality (Falana et al., 2025), multinational tax practices and financial investigation systems (Ofori & Appiah, 2025), and the management of external financial conditions across countries (Azra et al., 2024). Although these studies address different dimensions of multinational activity, collectively they demonstrate that multinational corporations cannot be treated as technologically neutral conduits. Rather, their willingness to transfer valuable knowledge depends on incentives, risks, governance arrangements, expected returns, contractual commitments, and the strategic significance of the knowledge involved.

Technology acquisition must therefore be distinguished from the mere importation or transfer of technological artifacts. A host-country organization may purchase equipment, obtain a production license, receive engineering documents, acquire software, or employ foreign consultants without developing the capabilities required to reproduce, modify, improve, or independently deploy the underlying technology. Successful technology acquisition requires the recipient to develop absorptive capacity, including relevant prior knowledge, skilled human resources, organizational learning mechanisms, technical infrastructure, knowledge documentation systems, and management commitment. Human capital is especially important

because advanced technology is frequently embedded in tacit practices and experiential knowledge that cannot be fully codified in manuals or contractual documents. Studies of contemporary multinational organizations emphasize the importance of employee engagement and human-capital strategies in extracting value from technologically transformed workplaces (Salvadorinho et al., 2025). Multinational evidence also shows that self-efficacy, emotion regulation, and work-related dispositions can influence employee engagement, illustrating more broadly that individual capabilities and motivational conditions affect how effectively human resources participate in organizational processes (Wang et al., 2025). From a technology-transfer perspective, these findings reinforce the importance of developing motivated, technically competent personnel who are able not only to receive information but also to engage actively in learning, problem solving, adaptation, and knowledge application.

The effectiveness of technology acquisition is also determined by the quality of interaction between technology providers and recipients. Technology transfer frequently involves joint teams comprising individuals from different organizational and national cultures, and the effectiveness of these relationships depends on communication, trust, coordination, leadership, and mutual understanding. Intercultural communication has therefore become a central management issue in multinational organizations, particularly where employees and managers must interpret different norms, expectations, and communication practices (Yılmaz, 2023). Cross-cultural leadership research similarly indicates that leadership practices within multinational corporations must respond to cultural dynamics rather than assuming uniform organizational behavior across national environments (Duy & Hieu, 2025). Evidence from multinational teams further emphasizes the importance of cross-cultural management for cooperation and operational performance in technically demanding sectors (Iriogbe et al., 2024). Cultural differences also influence multinational procurement and supply-chain relationships, affecting communication, negotiation, coordination, and partner expectations (Cooper, 2024). These considerations are highly relevant to international technology-transfer projects, where the transfer of complex knowledge often depends on sustained interpersonal interaction between experts rather than on formal documentation alone.

Cultural and institutional compatibility is particularly important because the same technological collaboration can produce different outcomes across host-country contexts. Multinational corporations must adapt their strategies to local cultural, regulatory, and market conditions while attempting to preserve organizational consistency. Research concerning ethical decision-making in multinational companies has demonstrated that cultural dimensions can shape organizational judgments and managerial behavior (Koerniawan et al., 2024). Studies of localization strategies likewise show that multinational enterprises must adjust their practices to the characteristics and expectations of host markets (Chu, 2025). Consumer-oriented research has similarly shown that the success of multinational enterprises in localized markets is affected by how effectively firms respond to locally specific expectations and meanings (Zhu, 2025). Although localization in marketing differs from technology transfer, the underlying managerial principle is comparable: international practices cannot simply be transplanted without adaptation to the receiving environment. For technology acquisition, this implies that technological knowledge must be aligned with domestic industrial capabilities, infrastructure, organizational routines, regulatory systems, and human-resource conditions if it is to become operationally sustainable.

The institutional environment surrounding multinational corporations constitutes another critical dimension of technology-transfer success. Government policies, legal systems, regulatory stability, contractual enforcement, intellectual-property arrangements, industrial development policies, and incentives for local capability development can all influence the degree to which foreign investment generates technological learning. Research on corporate citizenship in multinational corporations suggests that the relationship between corporate behavior and organizational performance varies under different legal traditions, illustrating the importance of institutional context in shaping multinational outcomes (Camoletto et al., 2024). Strategic corporate social responsibility in multinational organizations is similarly influenced by institutional drivers and by how organizational actors interpret and respond to institutional expectations (Yudarwati et al., 2023). Ethical and regulatory concerns associated with the adoption of artificial intelligence in multinational corporations also demonstrate that introducing advanced technologies requires governance frameworks that balance innovation with accountability, organizational readiness, and responsible implementation (Ahmad, 2024). These findings suggest that effective technology transfer requires an

institutional environment capable of aligning the incentives of technology providers with the long-term capability-building objectives of recipient organizations.

Technology acquisition is also shaped by the characteristics of the technology itself. Technologies differ in maturity, complexity, codifiability, modularity, cost, technological readiness, dependence on complementary assets, and sensitivity to contextual conditions. A mature and well-documented technology may be easier to transfer than an emerging technology whose application depends heavily on experiential know-how. Likewise, knowledge embedded in complex organizational routines may require prolonged cooperation, joint problem solving, training, and repeated application before the recipient can use it independently. The increasing digitization of multinational operations illustrates this interaction between technological sophistication and organizational capability. Studies of enterprise technologies such as SAP indicate that multinational implementation involves substantial compliance, security, and support challenges that extend beyond the technical installation of the system itself (Silva, 2025). Research on remote work in multinational corporations likewise demonstrates that technology-mediated organizational arrangements affect communication efficiency and productivity, showing that the organizational consequences of technology depend on the mechanisms through which it is integrated into work processes (Fan et al., 2024). Thus, successful technology acquisition requires attention not only to what technology is transferred but also to its readiness, complexity, organizational embeddedness, and compatibility with the recipient's existing technological base.

Another important consideration is the relationship between technological capability and organizational performance. Multinational corporations operate under intense pressure to maintain efficiency, service quality, brand consistency, accountability, and responsiveness across geographically dispersed operations. Research has linked employee-based capabilities to customer experience and organizational outcomes in multinational service organizations, underscoring the importance of internal competencies in transforming organizational resources into externally observable performance (Zhang et al., 2024). Other multinational research has examined environmental accountability and professional roles across countries, indicating that organizational responsibility is influenced by social and professional expectations within differing national environments (Wang & Smith, 2025). Even research conducted in substantively different domains using multinational samples demonstrates the methodological value of examining whether relationships remain consistent across heterogeneous national and cultural settings (Murphy et al., 2024). For technology-transfer research, this broader multinational literature supports the proposition that the outcomes of international organizational arrangements are contingent on contextual, organizational, and individual-level mechanisms rather than being uniform across environments.

The oil and gas sector magnifies these challenges because technology transfer occurs in an environment characterized by strategic resource dependence, geopolitical considerations, major capital commitments, high safety requirements, proprietary technologies, and close interaction between state institutions and international corporations. Oil-producing countries commonly seek to use cooperation with multinational companies not only to exploit hydrocarbon resources but also to develop domestic engineering capacities, specialized personnel, technological infrastructure, and independent operational competence. However, multinational enterprises may have limited incentives to transfer the most valuable elements of proprietary knowledge when doing so could create future competitors or reduce their technological advantage. Conversely, foreign firms may become more willing to transfer knowledge where long-term cooperation, market access, regulatory incentives, local-content obligations, and mutually beneficial relationships exist. The balance of bargaining power between technology provider and recipient therefore becomes an important determinant of the depth and quality of the transfer. The wider literature on multinational management consistently demonstrates the importance of balancing global corporate objectives with host-country expectations, local institutional constraints, and stakeholder relationships (Camoletto et al., 2024; Yudarwati et al., 2023).

For Iran, this issue is particularly significant because the country possesses extensive oil and gas resources and more than a century of experience with international petroleum operations, yet the development of autonomous technological capabilities has remained uneven. Cooperation with foreign petroleum companies has repeatedly created opportunities to obtain modern equipment, engineering services, specialized software, project-management knowledge, production methods, and technical expertise. Nevertheless, the existence of such opportunities does not guarantee the internalization of technological capability. Constraints may arise from discontinuities in international cooperation, sanctions, political conditions, contractual limitations, inadequate knowledge-management mechanisms, insufficient absorptive capacity, weak interorganizational coordination, limited continuity of expert teams, or the absence of systematic mechanisms for disseminating acquired knowledge within the

domestic industry. International experience in other large-scale and strategically important projects also indicates that successful hosting and implementation depend on institutional capacity, infrastructure, coordination, and the effective use of opportunities created through international engagement (Yousef Mostafa et al., 2024). These considerations suggest that Iran's challenge is not simply one of gaining access to foreign technology, but of establishing conditions through which access can be converted into sustainable technological competence.

From a strategic-management perspective, identifying the critical success factors of technology acquisition is therefore more useful than considering international technology transfer as a homogeneous process. Critical success factors refer to those organizational, technological, relational, and institutional conditions whose presence substantially increases the likelihood that a project will achieve its intended objectives. In international technology transfer, such factors may concern the recipient's absorptive capacity, selection of appropriate technology, human-resource development, management commitment, provider experience and motivation, quality of provider-recipient interactions, characteristics of technology-transfer contracts, institutional facilitation, government policies, cultural compatibility, and characteristics of the technology itself. These factors are interdependent. For example, access to sophisticated technology may produce little benefit when the recipient lacks trained personnel, while strong absorptive capacity may remain underutilized if the provider is unwilling to share critical knowledge. Similarly, a well-designed contract may not generate effective learning unless sustained interaction occurs between technical teams. Contemporary multinational research increasingly emphasizes precisely this interconnectedness among knowledge, people, governance, technology, and institutional context (Gao, 2026; Haiqiu et al., 2024; Salvadorinho et al., 2025).

Despite the expanding literature on multinational corporations, international management, organizational culture, human capital, localization, governance, and technology-intensive organizational change, an important gap remains in understanding how these dimensions interact in specific technology-acquisition projects in developing-country oil and gas industries. Much of the recent multinational literature concentrates on issues such as financial reporting (Falana et al., 2025), taxation and offshore strategies (Li, 2024; Ofori & Appiah, 2025; Yuan et al., 2025), organizational ethics (Ahmad, 2024; Koerniawan et al., 2024), cultural management (Cooper, 2024; Duy & Hieu, 2025; Yılmaz, 2023), localization (Chu, 2025; Zhu, 2025), and employee or organizational performance (Zaheer et al., 2024; Zhang et al., 2024). These streams provide important insights into multinational operations but do not, individually, explain why some international technology-transfer initiatives generate sustainable domestic technological capabilities while others result primarily in temporary access to foreign expertise. The problem is especially important where technology is complex and partly tacit and where the strategic objective is not simply project completion but the development of an independent capacity to reproduce, adapt, operate, and further develop the acquired technology.

Accordingly, an empirical investigation grounded in actual technology-transfer projects can provide a more contextually valid understanding of the mechanisms that determine successful technology acquisition. Case-based examination of international petroleum projects allows the experiences of managers and experts directly involved in technology transfer to be incorporated into the analysis and makes it possible to identify factors that may not be adequately captured through standardized quantitative instruments. A qualitative-exploratory approach is particularly appropriate where the phenomenon depends on tacit managerial experience, interorganizational relationships, institutional constraints, and context-specific technological conditions. Combining case evidence with a structured Delphi process further enables factors emerging from expert experience to be progressively evaluated until a meaningful degree of consensus is achieved. Such an approach is consistent with the wider recognition that multinational organizational phenomena are embedded in complex combinations of cultural, institutional, technological, and managerial conditions rather than being reducible to isolated variables (Efimenko, 2024; Iriogbe et al., 2024). It also provides a basis for developing a practical framework that can assist policymakers, petroleum organizations, research institutions, and managers in designing future international collaborations in a manner that prioritizes sustainable capability development rather than short-term access to foreign technology.

Therefore, the aim of this study was to identify and develop a model of the key success factors influencing technology acquisition in Iran’s oil and gas industries through multinational corporations, based on evidence from selected international technology-transfer projects and expert consensus obtained through the Delphi method.

2. Methods and Materials

The present study is applied research in terms of its purpose because, rather than focusing on purely theoretical issues, it seeks to examine various dimensions of a problem occurring in the actual industrial environment and, where possible, provide solutions to those problems (Sobhiyeh & Nasr, 2010). In addition, the study adopts a qualitative-exploratory approach and employs the Delphi method, which is widely used in this type of research.

In addition to the difference in the type of knowledge transfer being investigated, namely knowledge transfer in the oil and gas industry, the methodological approach adopted in this study constitutes another major distinction from previous studies in this field. Specifically, the study is based on in-depth interviews with experts and the extraction of findings from credible qualitative data, whereas previous studies have predominantly employed quantitative and survey methods.

A combination of purposive and snowball sampling was used to identify and select the experts. First, based on documents and reports published by the Iranian Ministry of Petroleum and other credible documents, a list of international projects undertaken in Iran's oil industry was compiled. A number of projects implemented in recent years were then selected because of the greater accessibility of their managers and experts.

Following initial meetings with a representative from each project, a list of potential experts was developed from among the specialists involved in each project. Individuals with greater experience and a more extensive professional background in the oil and gas industries and in international projects within these industries were identified and included in the final expert panel.

In accordance with snowball sampling, the list was updated after interviews with several participants; some individuals were removed, while more suitable candidates were added. Approximately 20 experts were contacted; however, ultimately, only 11 experts with substantial experience and professional backgrounds in international joint projects actively participated in the study. Table 1 provides further details regarding the experts participating in the research.

Table 1. Characteristics of the Experts Participating in the Three Delphi Rounds

Expert Characteristic	Category	Rounds 1, 2, and 3 (n = 11)	%
Age	30–40 years	4	36%
	40–50 years	5	45%
	Over 50 years	2	18%
Work experience in the oil industry	Less than 10 years	3	27%
	10–20 years	3	27%
	More than 20 years	5	45%
Project title	Mercaptan removal	4	36%
	Enhanced oil recovery	4	36%
	MTP	3	27%

A case study is a research method involving an in-depth investigation of a particular case, specific subject, or particular phenomenon. In case study research, one case is selected and examined from various perspectives (Sarmad & Bazargan, 1998).

Accordingly, three projects were selected: the mercaptan-removal technology project conducted with the assistance of the Russian company Tatneft; the Zagros Enhanced Oil Recovery project conducted with the assistance of the Norwegian oil company Statoil; and the acquisition of methanol-to-propylene production technology with the assistance of the German company Lurgi. A brief description of each project is provided below.

Reducing sulfur and mercaptan concentrations in petroleum fractions such as gasoline, liquefied petroleum gas, kerosene, and diesel fuel is of particular importance. Accordingly, the Research Institute of Petroleum Industry (RIPI) decided to acquire and localize mercaptan-removal technology. RIPI therefore entered into negotiations with Tatneft to achieve this objective through cooperation with the company, which possessed modern and appropriate technology in this field. The technology was transferred through a licensing arrangement.

Tatneft is one of the largest oil companies in Russia. The company operates as an operator in numerous oil fields in countries including Libya, Angola, Vietnam, Oman, Saudi Arabia, and Russia.

In this project, technology transfer was achieved in its substantive sense, and the key and fundamental technological information was transferred. As a result, RIPI is now independently capable of commissioning mercaptan-removal units on an industrial scale. The basic and detailed process designs were completed entirely by RIPI experts, and close research and

development collaboration between the two parties contributed positively to the development and advancement of the technology.

Table 2. Factors Identified in the Transfer of Mercaptan-Removal Technology

Dimension	Factors Identified in Technology Transfer	Selected Points Raised in the Interviews
Technology recipient	Capacity to absorb, disseminate, and adapt technology	Studying and training the workforce before initiating a new project; ensuring an appropriate match between the foreign partner and the absorptive capacity of domestic companies
Technology recipient	Clear goal setting and planning for knowledge acquisition	Appropriate schedules, processes, and mechanisms for technology transfer
Technology recipient	Selection of appropriate technology	Organizational awareness of technological needs based on priorities and constraints; conducting feasibility and needs-assessment studies
Technology recipient	Utilization of all domestic capacities	Assessing domestic capabilities and strengthening the required infrastructure
Technology provider	Willingness and motivation of the foreign company to transfer knowledge	Access to the host country's natural resources and market
Technology provider	Commitment, support, training, and assistance throughout the process	Training local recipient employees in new technologies; extent to which value-creating and critical components of knowledge are provided during cooperation
Technology provider	Political and international relations with the technology-recipient country	Appropriate relations with the technology-owning country
Cooperation context	Facilitating organization	Facilitating the outsourcing of parts of the technology transfer process; facilitating access to appropriate technological resources
Cooperation context	Cultural compatibility	National and organizational cultures of the two companies
Cooperation context	Participation of multiple actors in the transfer process	Identifying the principal owners of the required technology; establishing networks of partners in different countries; presence of strong suppliers within the local company's supply network
Nature of technology	Technology absorption cost	Minimizing technology absorption costs and considering the value added generated by the technology
Nature of technology	Technology life cycle	Competitiveness of the technology in the market; applicability of the transferred technology for commercialization and market utilization
Nature of technology	Technology readiness level	Reducing the risks associated with technology projects and mitigating the costs of technology testing; risks arising from the use of a technology in product development

The Norwegian oil company Statoil, one of the major and highly capable oil companies worldwide, expressed interest following negotiations in participating in comprehensive reservoir studies and preparing development plans for the Ahvaz, Marun, and Bibi Hakimeh fields. After the necessary assessments, Statoil selected the Research Institute of Petroleum Industry as its domestic partner. At the same time, the National Iranian Oil Company recognized Statoil as qualified to conduct the study and invited the company to cooperate.

The technology transfer program, referred to as TEP in the contract, included activities such as scientific and educational courses and seminars, on-the-job training, the purchase of required software, and other related measures.

Several months after completion of the project, RIPI was able independently to conclude contracts with the Petroleum Engineering and Development Company (PEDEC) for studies of the Yadavaran field, including the Kushk and Hosseinieh areas, and the Azadegan field, relying on the participation of an Austrian company only for certain parts of the work.

Table 3. Factors Identified in the Zagros Enhanced Oil Recovery Project

Dimension	Factors Identified in Technology Transfer	Selected Points Raised in the Interviews
Technology recipient	Capacity to absorb, disseminate, and adapt technology	Skills required to modify and disseminate acquired knowledge; close cooperation among research centers
Technology recipient	Human resource development and enhancement of technical skills	Availability of specialized human resources and their efforts toward reverse engineering
Technology recipient	Organizational learning culture	Documentation of acquired knowledge for future reference; workforce learning through on-the-job training provided by foreign partners
Technology recipient	Utilization of all domestic capacities	Assessment of domestic capabilities and strengthening of the required infrastructure; number of personnel and amount of resources allocated to acquiring knowledge from the foreign company
Technology recipient	Reform of organizational regulations	Inclusion of technology transfer responsibilities in organizational statutes; establishment of a technology transfer unit
Technology recipient	Commitment and willingness to acquire knowledge	Commitment and support from senior management; level of motivation and willingness to acquire deeper levels of technology

Technology provider	Previous technology transfer experience	Experience and duration of cooperation between the foreign investor and the local partner
Technology provider	Project quality and time requirements	Management dissatisfaction with project delays resulting from technology transfer requirements
Technology provider	Bargaining power of certain foreign parties	Monopoly over certain technologies
Cooperation context	Constructive interactions between the technology provider and recipient	Informal communication for knowledge exchange and generation of new ideas; short- or long-term employee visits to the parent company
Cooperation context	Government policies	Transparency of host-country policies concerning multinational corporations; commitment to a technology-oriented approach and development of technological infrastructure in different regions
Cooperation context	Characteristics of the technology transfer contract	Ability to define contractual provisions and the structure of cooperation, and expertise in contract drafting; expected objectives of the technology transfer contract
Nature of technology	Familiar and proven technology	Degree of maturity, complexity, and tacitness of knowledge
Nature of technology	Context dependence of knowledge	Impossibility of establishing a universal rule; differences among industries in their technological capacities for technology absorption

As part of efforts to acquire gas-conversion technologies, methanol-to-propylene (MTP) technology was identified as a new technology and placed on the agenda of the Petrochemical Research and Technology Company. The German company Lurgi was selected as the technology provider. Lurgi operates in the design and construction of process units in various fields, including chemicals, oil, gas, and petrochemicals, and maintains operations and representation in approximately 30 countries worldwide.

Following negotiations between the parties, it was agreed that Lurgi would continue the development and stabilization of the technology jointly with the Iranian party. Accordingly, Lurgi was responsible for providing the technical know-how, while the basic and detailed design of the process for a pilot-scale unit was to be carried out jointly under Lurgi's management. Construction of the pilot-scale unit in Mahshahr was financed by the Iranian party.

During implementation of the project, the Iranian company gained substantial mastery over a large proportion of the technological process and acquired highly valuable experience. The company's human-resource capabilities in various process and non-process areas also developed considerably during its technological collaboration with Lurgi.

Table 4. Factors Identified in the Methanol-to-Propylene Production Project

Dimension	Factors Identified in Technology Transfer	Selected Points Raised in the Interviews
Technology recipient	Utilization of all domestic capacities	Number of personnel and resources allocated to acquiring knowledge from the foreign company; assessment of domestic capabilities and strengthening of the required infrastructure
Technology recipient	Capacity to absorb, disseminate, and adapt technology	Participation of the domestic party in manufacturing the required equipment; necessity of adequate technical capacity for technology absorption
Technology recipient	Selection of appropriate technology	Identification of priorities and constraints
Technology provider	Level of knowledge and experience relative to the recipient	Technical capability of the source and the level of experience and human capital of the foreign company
Technology provider	Technology transfer experience	Project-management skills of the manager and technology transfer team
Technology provider	Willingness and motivation of the foreign company	Technological collaboration; capability and participation of the foreign company in knowledge transfer
Technology provider	Familiarity with the host country	Familiarity with the host country's culture and economy and awareness of local regulations
Cooperation context	Technology transfer facilitating organization	Degree and intensity of support provided by the facilitating organization for technology transfer
Cooperation context	Appropriate institutional framework	Dissemination of technology and prevention of repeated acquisition of the same technology by the country; institution-building to utilize national capacities for technology transfer
Cooperation context	Government policies	Existence of policies, laws, and support mechanisms related to technology transfer
Cooperation context	Interactions between the provider and recipient	Both parties' achievement of their interests, purposes, and objectives; history of cooperation, strength of relationships, level of interaction, and trust between the two companies
Cooperation context	Characteristics of the technology transfer contract	Content of technology transfer contracts; restrictive conditions imposed by the foreign company in the technology transfer contract
Cooperation context	Technology transfer laws and regulations	Need to establish an integrated, transparent, and stable body of technology transfer legislation; development of implementing laws and regulations oriented toward facilitating technology transfer

Cooperation context	Economic environment and business environment	Effective economic policies and provision of tax and tariff incentives; provision of financial facilities to support the financing of technology transfer; sanctions

3. Findings and Results

Given the qualitative and exploratory approach of the study, the first round was conducted using open-ended and semi-structured questions. The first-round questions were asked in face-to-face interviews regarding the factors affecting knowledge transfer from the foreign party, and additional questions were posed to the experts according to the direction of the discussion.

ATLAS.ti software was used to code the interview transcripts. To ensure the reliability of the identified factors, each interview transcript was reviewed several times by the researcher. The explanations and rationales provided by each expert concerning individual factors were used to refine the identified items or reclassify them where necessary.

At this stage, 30 factors, whose titles are presented in Table 5, were identified and used as the basis for designing the questionnaires for the second round.

Table 5. Factors Identified in the First Round and the Level of Expert Consensus Across the Three Delphi Rounds

Strategy Code	Factor	Round 1: Responses (n = 11)	Round 1: Consensus	Round 2: Responses (n = 11)	Round 2: Consensus	Change in Consensus From Previous Round	Round 3: Responses (n = 11)	Round 3: Consensus	Change in Consensus From Previous Round	Case 1	Case 2	Case 3
S01	Domestic company's technology absorptive capacity	10	91%	11	100%	+9%	11	100%	0%	*	*	*
S02	Facilitator support for technology transfer	10	91%	11	100%	+9%	11	100%	0%	*		*
S03	Selection of appropriate technology	11	100%	10	91%	−9%	11	100%	+9%	*		*
S04	Interaction between technology provider and recipient	8	73%	10	91%	+18%	9	82%	−9%		*	*
S05	Human resource development and technical skill enhancement	8	73%	9	82%	+9%	9	82%	0%		*	
S06	Participation of actors in technology transfer	7	64%	8	73%	+9%	9	82%	+9%	*		
S07	Institution-building for technology transfer and development	5	45%	9	82%	+37%	8	73%	−9%			*
S08	Company motivation and willingness to acquire knowledge	6	54%	8	73%	+19%	8	73%	0%		*	
S09	Knowledge and experience level of the knowledge provider	7	64%	9	82%	+18%	8	73%	−9%			*

S10	Context dependence of knowledge	3	27%	7	64%	+37%	8	73%	+9%		*	
S11	Characteristics of the technology transfer contract	7	64%	8	73%	+9%	7	64%	−9%		*	*
S12	Clear goal setting and planning	6	67%	7	58%	−9%	7	64%	+6%	*		
S13	Government policies and technology-related regulations	8	73%	8	73%	0%	7	64%	−9%			*
S14	Provider's familiarity with the host country	8	73%	7	64%	−9%	7	64%	0%			*
S15	Reform of the technology recipient company's regulations	4	36%	8	73%	+37%	7	64%	−9%		*	
S16	Organizational learning culture	8	73%	7	64%	−9%	7	64%	0%		*	
S17	Political and international relations between the parties	5	45%	8	73%	+28%	7	64%	−9%	*		
S18	Bargaining power of foreign parties	6	54%	7	64%	+10%	7	64%	0%		*	
S19	National and organizational cultures of the two companies	7	64%	5	45%	−19%	6	54%	+9%	*		
S20	Technology transfer laws and regulations	6	54%	7	64%	+10%	6	54%	−10%			*
S21	Previous technology transfer experience	7	64%	6	54%	−10%	6	54%	0%		*	*
S22	Utilization of all domestic capacities	6	54%	6	54%	0%	6	54%	0%	*	*	*
S23	Technology readiness level	4	36%	7	64%	+28%	6	54%	−10%	*		
S24	Commitment, support, training, and assistance	7	64%	6	54%	−10%	5	45%	−9%	*		
S25	Economic context and business environment	6	54%	5	45%	−9%	5	45%	0%			*
S26	Familiar and proven technology	5	45%	5	45%	0%	5	45%	0%		*	

S27	Technology life cycle	3	27%	5	45%	+18%	5	45%	0%	*	
S28	Foreign company's motivation for technology transfer	5	45%	6	54%	+9%	4	36%	−18%	*	*
S29	Technology absorption cost	5	45%	4	36%	−9%	4	36%	0%	*	
S30	Project quality and time requirements	3	27%	5	45%	+18%	4	36%	−9%		*

In the second round, the factors identified in the first round were listed in descending order according to the number of experts who had mentioned each factor. The experts were then asked to select and report the 10 factors that they considered more important than the others.

The response rate was 100%, primarily because the first round had been conducted face-to-face and because the experts were interested in expressing their views regarding the factors identified during the interviews.

At this stage, between 64% and 100% of the experts, with an average consensus level of 83%, agreed on the importance of 10 of the 30 factors identified in the first round. However, as shown in Table 5, the results obtained in the second round differed to some extent from those of the first round, such that the rankings of some factors changed.

Because of the differences between the results of the first and second rounds, and in order to ensure the reliability of the second-round results, feedback from both the first and second rounds was provided to the experts. They were then asked once again to select and submit the 10 factors that they considered more important than the others.

At this stage, the experts were also asked to explain their reasons whenever their responses differed from those provided in the second round.

In the third round, between 73% and 100% of the experts, with an average consensus level of 83%, agreed on the top 10 factors. In addition, more than 50% agreement was obtained for factors ranked 11 through 23.

Although the rankings of some factors shifted by one or two positions during this round, the top 10 factors were the same as those selected in the second round.

The Delphi process could have been continued for a fourth round or even additional rounds; however, because there were no substantial differences between the rankings of the factors in the second and third rounds and a satisfactory level of consensus had been achieved, no further rounds were conducted.

4. Discussion and Conclusion

The present study sought to identify the key success factors influencing technology acquisition in Iran's oil and gas industries through multinational corporations and to develop a model grounded in evidence from three technology-transfer projects and expert consensus. The findings showed that, although 30 factors were initially identified through qualitative interviews and thematic analysis, the Delphi process resulted in agreement on 10 factors as the most critical determinants of successful technology acquisition. These factors were: the domestic company's technology absorptive capacity; support from a facilitating organization for technology transfer; selection of appropriate technology; interactions between the technology provider and recipient; human resource development and enhancement of technical skills; participation of different actors in the technology-transfer process; institution-building for technology transfer and development; the recipient company's motivation and willingness to acquire knowledge; the level of knowledge and experience possessed by the technology provider; and the context dependence of knowledge. The stability of these 10 factors across the second and third Delphi rounds indicates that the experts viewed successful technology acquisition as a multidimensional process that cannot be explained solely by access to foreign technology. Instead, success depends on the interaction of recipient capabilities, provider characteristics, institutional arrangements, interorganizational relationships, and the inherent characteristics of the knowledge being transferred.

The highest level of consensus was obtained for the domestic company's absorptive capacity, which reached 100% agreement in both the second and third Delphi rounds. This finding indicates that the ability of the recipient organization to recognize, assimilate, disseminate, adapt, and apply external knowledge constitutes the most fundamental prerequisite for successful technology acquisition. Technology transfer does not automatically lead to technological capability merely because foreign knowledge, equipment, or expertise becomes available. The recipient organization must possess sufficient technical infrastructure, prior knowledge, learning routines, qualified personnel, and knowledge-management mechanisms to convert externally obtained information into operational competence. This result is consistent with the broader literature on multinational corporations, which emphasizes the strategic importance of knowledge integration and organizational mechanisms for transforming dispersed information into performance improvements (Gao, 2026). It is also compatible with evidence showing that multinational enterprises face significant human-resource management challenges when operating across international environments, particularly in relation to competency development, organizational adaptation, and coordination of knowledge-intensive activities (Haiqiu et al., 2024). The present findings therefore suggest that technology acquisition in the Iranian oil and gas sector should be understood primarily as an organizational learning process rather than as a simple contractual or equipment-purchasing process.

Support from a facilitating organization also achieved 100% consensus in the second and third rounds, demonstrating the importance of intermediary institutions in creating the conditions required for effective technology transfer. Facilitating organizations can reduce information asymmetries, identify appropriate technological sources, coordinate relationships among participating organizations, support negotiations, resolve procedural barriers, and create mechanisms for disseminating acquired knowledge. In complex international projects, especially those involving multiple public and private actors, the absence of an effective coordinating institution may cause fragmentation and duplication of technological efforts. This finding is consistent with research emphasizing that the institutional environment substantially influences how multinational corporations behave and how they respond to host-country expectations (Camoletto et al., 2024). Similarly, Yudarwati et al. demonstrated that institutional drivers influence strategic organizational behavior in multinational companies through processes of interpretation and organizational response (Yudarwati et al., 2023). Thus, the role of facilitating institutions extends beyond administrative support; such institutions can create continuity, coordinate technological learning across projects, and ensure that knowledge acquired in one project becomes accessible to other domestic actors.

Selection of appropriate technology was another factor that reached 100% consensus in the third Delphi round. This result emphasizes that successful acquisition depends not on obtaining the most advanced available technology, but on selecting technology that corresponds to the recipient's strategic priorities, technical capabilities, industrial infrastructure, economic requirements, and long-term development objectives. Inappropriate selection can create technological dependence, increase operating and maintenance costs, or result in the acquisition of systems that cannot be effectively assimilated under domestic conditions. The importance of contextual adaptation is evident in research on multinational corporations showing that localization strategies are essential when international companies operate in distinctive host-country environments (Chu, 2025). Related evidence indicates that the ability of multinational enterprises to adapt offerings and practices to local expectations influences the success of international operations (Zhu, 2025). Although these studies concern market localization rather than industrial technology transfer, they reinforce the broader principle that imported systems and practices must fit local contexts. In the oil and gas industry, such alignment requires systematic technological needs assessment, feasibility analysis, assessment of domestic capabilities, and evaluation of the future strategic value of the technology before contractual commitments are made.

Interactions between the technology provider and recipient achieved 91% consensus in the second round and 82% in the third round, remaining among the 10 leading factors. This finding highlights the relational nature of knowledge transfer, particularly where knowledge contains tacit components that cannot be adequately communicated through technical documents alone. Continuous interaction, informal communication, joint problem solving, staff visits, shared technical teams, and long-term cooperation can facilitate the exchange of experiential knowledge and help recipients understand how technologies operate under different conditions. The importance of communication is supported by research showing that intercultural communication is a central determinant of organizational effectiveness in multinational environments (Yılmaz, 2023). Cross-cultural leadership research has similarly shown that multinational organizations must manage differences in communication,

expectations, and leadership practices in order to create productive collaboration (Duy & Hieu, 2025). Studies of multinational teams also emphasize that effective cross-cultural management facilitates coordination among specialists with diverse national and professional backgrounds (Iriogbe et al., 2024). Furthermore, cultural differences can affect procurement, negotiation, information exchange, and trust within multinational supply chains (Cooper, 2024). Collectively, these studies support the present result that technology transfer becomes more effective when provider-recipient relations move beyond formal contractual interaction toward sustained collaborative learning.

Human resource development and technical skill enhancement constituted another key factor, reaching 82% consensus in both the second and third Delphi rounds. This result is particularly important because technological knowledge ultimately becomes sustainable only when it is embedded in the competencies of domestic personnel. Training, on-the-job learning, participation in design and engineering activities, reverse engineering, involvement in commissioning, and joint problem solving can transform technology transfer from external dependence into domestic capability formation. This finding aligns with the emphasis placed on human capital in multinational organizations. Salvadorinho et al. showed that effective human-capital strategies are increasingly important in technology-intensive and multigenerational work environments (Salvadorinho et al., 2025). Similarly, evidence from multinational settings indicates that employee engagement is influenced by self-efficacy and other individual-level capabilities that determine willingness to invest effort in organizational tasks (Wang et al., 2025). In technology acquisition, the implication is that recipient organizations must not treat training as a peripheral contractual activity; instead, human resource development should be integrated into the core architecture of the transfer project and evaluated as a principal project outcome.

The participation of multiple actors in technology transfer also emerged as a critical success factor and increased from 64% agreement in the first round to 82% in the third round. This increase suggests that experts increasingly recognized technology acquisition as an ecosystem-level process involving more than a bilateral relationship between one foreign provider and one domestic recipient. Research institutes, engineering companies, universities, equipment suppliers, regulatory agencies, financing institutions, and specialized contractors can all contribute complementary resources and knowledge. This interpretation is consistent with contemporary multinational management research showing that international firms operate through complex organizational and supply-chain networks rather than isolated bilateral relationships (Cooper, 2024; Gao, 2026). International business research also shows that firms strategically configure organizational and financial activities across borders in response to competitive and institutional conditions (Yuan et al., 2025). Therefore, the findings imply that technology-transfer policies should encourage network formation and structured participation by relevant domestic actors so that technological knowledge is distributed more widely and repeated acquisition of the same knowledge can be avoided.

Institution-building for technology transfer and development showed one of the largest increases in consensus, rising from 45% in the first round to 82% in the second round and remaining at 73% in the third round. This change suggests that experts came to place greater importance on institutional continuity as they compared the factors across Delphi rounds. Individual projects can produce temporary technological gains, but without stable institutional structures for storing, disseminating, coordinating, and further developing acquired knowledge, these gains may remain localized and vulnerable to personnel turnover or organizational restructuring. Research on multinational corporate citizenship demonstrates that legal and institutional arrangements shape corporate behavior and performance across national contexts (Camoletto et al., 2024), while research on strategic corporate responsibility shows that institutional pressures influence organizational priorities and responses (Yudarwati et al., 2023). Research examining innovation in multinational enterprises likewise points to the significance of organizational and environmental structures that support innovation activities (Efimenko, 2024). The present results extend these insights by suggesting that dedicated technology-transfer institutions, databases, organizational units, and coordination mechanisms are necessary for converting individual international projects into cumulative national technological development.

The recipient company's motivation and willingness to acquire knowledge also achieved 73% consensus in both the second and third Delphi rounds. This finding indicates that successful acquisition requires active learning behavior from the domestic partner. Even where the provider offers substantial technical information, the transfer may remain superficial if recipient managers and employees are insufficiently motivated to obtain deeper levels of technological knowledge. Management commitment, allocation of personnel, assignment of financial resources, explicit learning objectives, and organizational

incentives may therefore determine how actively the recipient participates in knowledge acquisition. This interpretation is consistent with evidence showing the importance of employee engagement and motivational conditions in maximizing human-capital potential (Salvadorinho et al., 2025). It is also supported indirectly by research showing that organizational role clarity and autonomy influence employee functioning in multinational organizations (Zaheer et al., 2024). When employees understand their responsibilities for learning and are given sufficient autonomy to engage with technical problems, they are more likely to develop meaningful capabilities from international cooperation.

The level of knowledge and experience possessed by the technology provider was also identified among the final 10 factors, with 73% consensus in the third Delphi round. Not all foreign partners are equally capable of transferring knowledge, even when they possess relevant technology. Successful providers require technical expertise, experienced personnel, project-management competence, previous technology-transfer experience, and the capacity to communicate knowledge effectively to organizations operating in different institutional and cultural environments. Research on innovation by multinational enterprises reinforces the importance of firm-level innovative capabilities and organizational experience (Efimenko, 2024). Similarly, technological implementation studies demonstrate that highly sophisticated systems require specialized support capabilities and knowledge to address technical, security, and compliance challenges (Silva, 2025). The findings therefore imply that foreign partners should be selected not solely on the basis of ownership of a desired technology, but also on their demonstrated ability and willingness to transfer that technology effectively.

Context dependence of knowledge was the final factor among the 10 highest-ranked determinants, rising from only 27% consensus in the first round to 73% in the third round. This marked increase is particularly informative because it shows growing expert recognition that technological knowledge cannot always be detached from the environment in which it was developed. Some knowledge is embedded in organizational routines, industrial infrastructures, regulatory systems, workforce capabilities, supplier networks, or environmental conditions. This result aligns with a broad body of multinational research demonstrating that organizational practices vary in effectiveness across cultural and institutional contexts. Cultural dimensions influence ethical decision-making (Koerniawan et al., 2024), localization affects multinational strategies (Chu, 2025), and national environments influence professional expectations and organizational accountability (Wang & Smith, 2025). Studies of multinational organizations also demonstrate that geographically distributed work and technology-mediated communication can produce different outcomes depending on organizational conditions (Fan et al., 2024). Accordingly, technology transfer to the Iranian oil and gas industry requires adaptation rather than replication. Technologies and associated practices must be modified to fit domestic operating conditions, technical infrastructures, regulatory arrangements, and human-resource capabilities.

The factors that did not enter the final group of 10 are also theoretically meaningful. Contract characteristics, government policies and technology-related laws, organizational learning culture, political relations, bargaining power, technology readiness, technology life cycle, cost of absorption, and the motivation of the foreign company received moderate rather than dominant consensus. Their lower ranking should not be interpreted as indicating that they are unimportant; rather, the experts appear to have regarded them as secondary or enabling conditions compared with the more fundamental determinants of absorptive capability, institutional support, appropriate technology selection, and effective interaction. The multinational literature confirms that governance and regulatory conditions remain consequential. Studies of multinational taxation and financial regulation show that firms respond strategically to legal and institutional incentives (Li, 2024; Ofori & Appiah, 2025), while research on financial reporting indicates that organizational attributes influence compliance-related outcomes (Falana et al., 2025). Ethical governance of advanced technologies likewise requires appropriate regulatory and organizational frameworks (Ahmad, 2024). These findings suggest that regulatory conditions may exert their effects indirectly by shaping incentives, relationships, investment decisions, and organizational behavior rather than functioning as isolated determinants of acquisition success.

Overall, the results indicate that effective technology acquisition in Iran's oil and gas industries is best understood as a systemic capability-building process. The three case studies demonstrated that technology transfer was most successful when recipient organizations possessed sufficient absorptive capacity, actively engaged in learning, developed personnel, interacted intensively with capable foreign partners, and operated within supportive institutional arrangements. This interpretation is

compatible with the broader multinational literature demonstrating that organizational performance depends on the alignment of human capital, knowledge, technology, institutional conditions, and stakeholder relationships (Gao, 2026; Haiqiu et al., 2024). It also accords with evidence indicating that multinational outcomes are influenced by localization, cross-cultural interaction, institutional context, and organizational adaptation (Duy & Hieu, 2025; Yudarwati et al., 2023). Although some studies in the supplied literature focus on different multinational phenomena, including financial structures (Azra et al., 2024), consumer responses (Zhu, 2025), service experience (Zhang et al., 2024), international event-related opportunities (Yousef Mostafa et al., 2024), and even multinational behavioral comparisons (Murphy et al., 2024), they collectively reinforce the principle that outcomes observed in multinational settings emerge from interaction between organizational characteristics and national or institutional context. The present study extends this perspective to technology acquisition by showing that foreign technology produces sustainable value only when access is transformed into indigenous learning, technical competence, and institutionalized technological capability.

The present study has several limitations that should be considered when interpreting its findings. First, the expert panel consisted of 11 participants, and although these individuals had substantial experience in international oil and gas projects, the relatively small sample limits the extent to which the findings can be generalized to all technology-transfer projects in Iran. Second, the empirical analysis focused on three selected projects involving mercaptan-removal technology, enhanced oil recovery, and methanol-to-propylene technology; consequently, projects involving other technological domains, contractual arrangements, foreign partners, or historical periods may produce different patterns. Third, the study relied primarily on expert perceptions obtained through interviews and Delphi rounds, which may be affected by retrospective judgment, individual experience, and organizational position. Fourth, the study concentrated on identifying and prioritizing critical factors rather than quantitatively estimating the magnitude, direction, or causal relationships among these factors. Finally, because technology transfer is strongly influenced by changing political, economic, regulatory, and international conditions, the relative importance of the identified factors may change over time.

Future studies should examine the proposed model using larger and more diverse samples of managers, engineers, policymakers, researchers, contractors, and technology-transfer specialists from different segments of the oil, gas, refining, and petrochemical industries. Quantitative studies could develop validated measurement scales for the identified factors and test their relationships with technology-transfer outcomes using structural equation modeling, multilevel modeling, or configurational approaches. Comparative research between successful and unsuccessful technology-transfer projects would also help determine which combinations of factors are necessary or sufficient for effective acquisition. Longitudinal studies are recommended to examine how transferred knowledge is retained, disseminated, adapted, and developed several years after project completion. Future research could also compare different contractual mechanisms, countries of origin, technology maturity levels, and modes of cooperation. Particular attention should be given to the interactions among absorptive capacity, institutional support, provider motivation, human-resource development, and knowledge context dependence, because these factors may reinforce or constrain one another rather than operate independently.

Managers and policymakers in Iran's oil and gas industries should treat technology acquisition as a planned capability-development program rather than as a secondary component of procurement or international contracting. Before selecting a foreign partner or technology, recipient organizations should assess technological needs, domestic absorptive capacity, infrastructure, available expertise, and the strategic relevance of the proposed technology. Technology-transfer contracts should include explicit learning objectives, staff-training requirements, joint engineering activities, documentation obligations, access to critical technical knowledge, and measurable indicators of domestic capability development. Dedicated facilitating institutions and technology-transfer units should coordinate projects, preserve acquired knowledge, prevent duplication, and disseminate technological learning across organizations. Domestic engineers and specialists should participate directly in design, implementation, commissioning, troubleshooting, and adaptation activities rather than remaining passive observers. Finally, evaluation of international projects should extend beyond whether the technical project was completed successfully and should determine whether the domestic organization can subsequently operate, reproduce, modify, improve, and further develop the acquired technology independently.

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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