Petroleum Business Review

Research Article- Energy Management and Engineering

Petroleum Business Review, Vol. 5, No. 2, pp. 59–73, Spring 2021

An Empirical Analysis of Outsourcing Using Structural Equations: The Model of Outsourcing Development Management of Physical Assets in the Oil and Gas Industry

Saeid Tavakoli[a], Farideh Haghshenas Kashani[b*], and Alireza Amirkabiri[c]

[a] *Ph.D. Candidate, Public Management Department, Central Tehran Branch, Islamic Azad University, Tehran, Iran. Email: tavakoli_sa@nigc.ir*

[b] *Assistant Professor, Business Management Department, Central Tehran Branch, Islamic Azad University, Tehran, Iran. Email: f_haghshenas@iauctb.ac.ir*

[c] *Associate Professor, Public Management Department, Central Tehran Branch, Islamic Azad University, Tehran, Iran. Email: Ali.Amirkabiri@iauctb.ac.ir*

ARTICLE INFO

Keywords:
Internal Capability
Model Fit
Outsourcing
Physical Assets
Structural Equations

Received: 03 March 2021
Revised: 17 April 2021
Accepted: 26 April 2021

DOI: 10.22050/pbr.2021.275877.1171

ABSTRACT

Despite numerous upstream communications, there is still no comprehensive and reliable model for implementing these tasks, neither in the literature nor in the oil and gas industry. Previously developed models focus more on the outsourcing process. It seems that no outsourcing model has been developed to utilize internal capabilities in a portfolio of alliances and be compatible with the unique characteristics of Iran's oil and gas industry. In an attempt to validate the components of the "model of development outsourcing physical assets in the oil and gas industry, with the approach of upgrading internal capacity", this study used a questionnaire in a Likert scale (very high, high, moderate, low, and very low). One hundred two people participated, and 100 completed questionnaires were received from the population. The validity of the variables and the questionnaire were examined using confirmatory factor analysis. SPSS and Smart PLS software packages were used in this research, and the error probability level (α) was considered 0.05. The results showed that the model has a good fit. According to the Geiser index, the fit of the model was medium to high, and the goodness of fit criterion was equal to 461.0, indicating the optimal fit of the model.

1. Introduction

In recent years, managers have faced an inevitable and definite change in the operational environment. At the beginning of the new century, the accelerating trend toward the diversification of new products and services, shortening the life cycle of products and services, increasing demand for specific products, rapid segmentation and specialization of markets, and

* Corresponding author

generally competitive production has left companies with many problems. As a result of these developments, old production methods have lost their efficiency, and the need for new methods and philosophies that ensure the survival and development of an organization in the current unstable conditions is well felt. The emergence of global markets and competitors and new competitive strategies (based on quality, speed, and partnerships) have forced managers to adopt new management strategies, structures, and systems. Managers prefer companies and organizations that are agile, flexible, accountable, competitive, innovative, efficient, customer-oriented, and profitable. Small organizations are more flexible, and their management is dynamic; innovation, creativity, and initiative are encouraged.

The costs of supply chain management are the main element in managing the total cost and increasing the profitability of the company. Supply decisions are not limited to product process materials and components and can also be generalized to non-productive activities such as service, support, and engineering services. Nowadays, organizations outsource various activities in design, assembly, product development, marketing, and product delivery to end customers (Mishra et al., 2018). For example, companies in the oil, gas, and petrochemical industries have hundreds of different assets and services that can be outsourced. The quality of the available information and the assumptions used in the analysis affect supply decisions. Such decisions take into account, in addition to cost–benefit considerations, strategic issues, financial valuation, performance, and risk dimensions concerning supplier quality, reliability, delivery times, and delivery. A wrong decision can lead to higher product and service costs, wasted resources, lost opportunities, customers, and market shares. In this regard, outsourcing has been proposed as a new approach that provides accountability and accelerated actions for an organization in the face of possible changes (Daneshi and Delavari, 2008, 2).

Many organizations are moving from routine internal activities to new technology development and collaboration programs. In outsourcing, we decide which activities take place within the organization, which ones occur outside, which resources we need to have, and which ones we need to procure from outside the organization. In general, due to limited resources and financial shortages, outsourcing is an issue that most companies have to acquire the necessary technologies and ensure the performance of all their activities.

What can find a difference between organizations and their capabilities in achieving their goals is appropriately managing the organization's assets, capabilities, and costs so that the highest possible efficiency and organizational performance is achieved with the lowest possible cost. Outsourcing can be a great help in achieving organizational ideals and goals and provide benefits for the organization. Meanwhile, identifying and prioritizing the factors affecting outsourcing can help managers implement organizational structures tailored to the organization's needs and use the power outside the organization to achieve the highest productivity (Kavosh and Chenari, 2018).

Langford and Parsa (1999) stated that outsourcing is the procurement of products and services from sources outside the organization. Outsourcing enables a company to focus on its core business (Mishra, quoted by Kakabadse and Kakabadse, 2005) and improves its performance (Mishra, quoted by Novak and Bastinza, 2018). Outsourcing means a contractual relationship with a foreign company that enables the provision of goods and services tailored to the company's needs (Mishra, quoted by Kakabadse and Kakabadse, 2005). According to these and other definitions, outsourcing includes allocating or redistributing business activities from an internal source to an external source. Using outsourcing as a strategy can benefit the organization, provided it is properly planned and managed with competence (Seyed Javadin, Hassangholipour, 2011).

Most companies have chosen outsourcing to minimize costs (Mishra quoted by Jiang and Data, 2018) and increase market value (Mishra quoted by Jiang, 2018). However, despite the growing trend of outsourcing, only a handful of practitioners view it as a transformational strategy (Mishra to Nephel from Linder, 2018). It can be imagined that the use of materials and energy and capabilities of organizations outside the scope of the company following the activities of the organization and planning to use this prioritization in organizational programs can pave the way for the right decisions of managers and appropriate organizational strategies to achieve good productivity in the field of outsourcing in the organization and benefit the organization from this positive value (Kavosh and Chenari, 2018). Awareness of outsourcing errors will help improve the identification, evaluation, and development of the outsourcing cycle. Therefore, determining and completing the outsourcing process, including strategic assessment, needs analysis, contractor evaluation, negotiation, contract management, project initiation and transfer, outsourcing

relationship management to follow-up, and modification or exit strategies.

Various emerging and different outsourcing activities require unique arrangements, including in-boundaries outsourcing, cross-border outsourcing, transfer outsourcing, co-outsourcing, online outsourcing, trade change outsourcing, trade process outsourcing, U-turn outsourcing, and added value corporate and multiple outsourcing. The types of risks that manage an organization depend on several factors, including the type of outsourcing agreed upon. Some authors categorize the types of outsourcing according to each stage or following each type of outsourcing (Chen, 2020).

Despite numerous upstream communications, there is still no comprehensive and reliable model for implementing these tasks, neither in the literature nor in the industry. Nonetheless, previously developed models such as outsourcing process frameworks (Perunović and Pedersen, 2007), management of outsourcing assets in municipalities (Hassani and Saadi, 2005), public sector outsourcing model (Rajabzadeh et al., 2008), a framework for outsourcing in the supply chain (Tracy, 2018), a framework developed for the outsourcing process (Zambery, 2011), a framework for outsourcing IT in transportation (Nikitakos et al., 2007), a conceptual model of IT outsourcing in transportation (Nikitakos et al., 2007), outsourcing model (ISO37500: 2014), outsourcing professional knowledge body model (2014IAOP), physical asset management model (ISO 55000: 2014), and physical asset management model (statute of physical asset management Ministry of Petroleum, 2018) focus more on the outsourcing process. An outsourcing model developed to utilize internal capabilities in a portfolio of alliances and compatible with the unique characteristics of the oil and gas industry has not been designed, so the outsourcing development management model in the oil and gas industry with the domestic capability approach (Tavakoli et al., 2020) is a new one of this kind, at least, in Iran.

One of the sectors that the Iranian officials have continuously considered in recent decades is outsourcing in the oil and gas industry, but at the national and the industry level, despite the great emphasis, the share of asset outsourcing is still much lower than expected. Furthermore, the outsourcing of physical assets of the oil and gas industry, as a strategic industry in the country, is essential due to its scope and effects on all economic, social, and security aspects of the country. Especially when outsourcing leads to domestic capabilities in terms of simultaneously upgrading the capabilities of current stakeholders and contractors in this field. Evidence shows that achieving superior economic, financial, commercial, organizational, human, systemic, and qualitative results will be possible with a systemic approach to outsourcing physical assets.

As the largest company exploiting the physical assets of the country's gas industry and a company whose assets are spread throughout the country, Iran Gas Transmission Company is associated with the entire production and import, storage, consumption, and export chain of gas; has complex engineering, exploitation, processes, and management of physical assets; and has the potential and actual ability to become a model and driver of outsourcing in the oil and gas industry. There is also a willingness of senior executives and their affiliates to move toward outsourcing goals. Thus, it can be one of the best case studies to answer how to achieve the expected results in the oil and gas industry while paying attention to capacity for developing strategies internally. In this regard, Tavakoli et al. (2020) developed a model for the development of outsourcing of physical assets in the oil and gas industry, with the approach of upgrading domestic capacity (Iran Gas Transmission Company) that the present study seeks to validate and examine the various components of this model set.

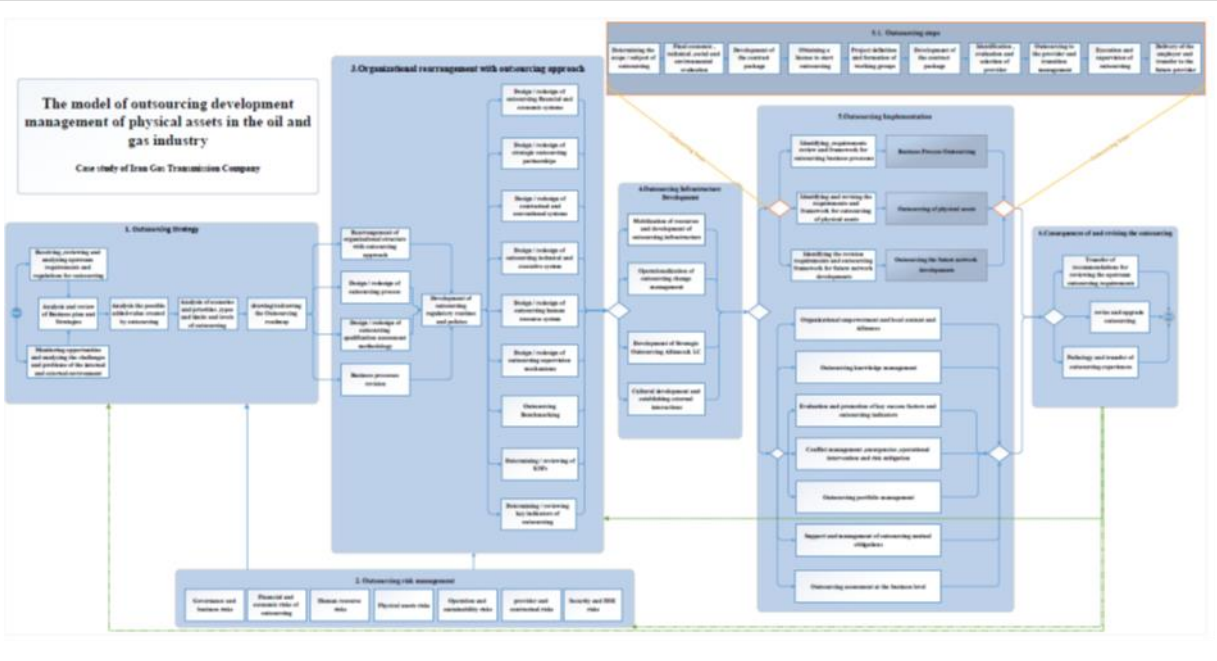

Figure 1. The model for outsourcing physical assets in the oil and gas industry, with an internal empowerment approach (Tavakoli et al., 2020).

2. Materials and methods

Related studies are mentioned below, given the importance of outsourcing and the gaps in this field.

Kavosh and Chenari (2015) conducted a study entitled "Identification and Prioritization of Factors Affecting Outsourcing in Khuzestan Gas Company" to identify and prioritize the factors affecting outsourcing in that company. For this purpose, a questionnaire consisting of thirty questions was designed based on the Likert scale and distributed among 20 experts working in that company. This Delphi panel was selected by the snowball method. In the second stage, another questionnaire was prepared to assess the preference of the criteria, and six factors were identified and determined based on their preference.

Nourang et al. (2019), in "Study of Scheduling in Oil and Gas EPC Projects Based on Implementation Outsourcing Strategy and Contract", found that the nature of process engineering in oil and gas projects has a remarkable effect on how to outsource implementation. In this study, the business model of project-oriented companies, the life cycle of the oil and gas project, and the relationship between outsourcing strategy and contract execution based on the process engineering of a refinery during the project life were examined.

Eslami et al. (2016), in the "Study of Outsourcing Strategies Effects in Improving the Organizational Performance of Iranian Industrial Companies", indicated that outsourcing of core activities, international outsourcing, and short-term outsourcing have a positive effect on market value, and the outsourcing of non-core (subsidiary) activities, internal outsourcing, and long-term outsourcing do not improve the market value of outsourcing companies.

In "Evaluating the Effectiveness of Outsourcing Training Courses of the National Iranian Gas Company", Fallah et al. (2016) collected research data based on three levels of crack Patrick. They conducted a semi-structured interview with a researcher-made questionnaire that confirmed its validity and reliability. A one-sample t-test, chi-square goodness, and Friedman test were used for one-way analysis of quantitative data. Findings indicate the effectiveness of the courses and the excellent performance of the organizers.

Katato et al. (2020) explored the critical perspectives of many research papers from 2000 to 2018 on two types of business process outsourcing and information technology outsourcing. According to the study, many of these studies focused on corporate outsourcing and the reasons for outsourcing to enable the organization to target their core business and help them properly develop their ongoing competitive advantage. In this study, the

outsourcing process involves continuous decision-making throughout the life cycle of the outsourcing contract. They conclude that maintaining outsourcing throughout its contract period is the most crucial issue in the outsourcing management strategy.

In "A Review of Production and Operations Management Research on Outsourcing in Supply Chains", Tsay et al. (2018) compared the theory of the firm with outsourcing the operations and production and sought to establish a stronger link between strategy, economics, and production and operations management from an outsourcing perspective.

Oshri et al. (2015), in "Examining the Shadow of Outsourcing on Reducing Allocation or Costs", introduced tools for monitoring, analyzing, and managing outsourcing for small and medium-sized enterprises. Monitoring and managing aspects of outsourcing relationships could determine how outsourcing efforts were practical and, as a result, reduce risk and costs.

Jiang and Qureshi (2006) tried to establish the necessary relationship between outsourcing implementation and measuring company performance. They identified three main gaps in the literature review, the lack of a unit of measurement to evaluate outsourcing results, the gap in the relationship between outsourcing implementation and firm value, and the research gap on outsourcing contracts.

Embleton and Wright (1998) stated in "A Practical Guide to Successful Outsourcing" that, on average, companies using outsourcing strategy have been able to save a 9% of the cost and achieve a 15% increase in capacity and quality. After enumerating success factors in outsourcing, they mentioned that outsourcing, if properly handled, offers the great promise of cost savings. Successful outsourcing requires advanced analysis, research, planning, and human and managerial resources.

2.1. Purpose of the research

In this study, a bunch of hypotheses was examined: Outsourcing management through organizational rearrangement mediator impacts outsourcing implementation; Risk management through the outsourcing management mediator affects organizational rearrangement; Risk management affects the implementation of outsourcing through the mediating variable of organizational rearrangement; Organizational rearrangement affects the implementation of outsourcing through the mediating variable of outsourcing infrastructure development; Rearrangement through implementation mediator variable impacts outcomes; Development of outsourcing infrastructure through implementation mediator influences outcomes.

Moreover, complementary hypotheses were as follows. External management affects organizational rearrangement; organizational rearrangement influences the development of outsourcing infrastructure; organizational rearrangement affects the implementation of outsourcing; risk management impacts outsourcing management and organizational rearrangement; risk management affects the implementation of outsourcing; infrastructure development influences outsourcing implementation; outsourcing steps affect the outsourcing implementation; outsourcing implementation impacts outcomes; outcomes affect outsourcing leadership; outsourcing outcomes and outsourcing review influence outsourcing risk management.

2.2. Research methodology

The statistical population of the research includes managers and experts in the field of outsourcing with knowledge of the oil and gas industry. The data collection tool is a researcher-made questionnaire. It should be noted that the questionnaire is based on the model developed by Tavakoli et al. (2020). Factor analysis was used to validate the components and dimensions of the outsourcing development management model, and structural equations were used to test the hypotheses.

2.3. Research tools and assessment of validity and reliability

After literature review and interviews, the model and categories of outsourcing development management were determined. Then, with several experts' guidance, the enumerated categories were converted to a questionnaire. The experts presented the questionnaire, and the Lawshe coefficient was calculated. In fact, in this study, a questionnaire was used to confirm or reject the components, and the experts expressed their opinions about the components in a five-point Likert scale (very high, high, medium, low, and very low). This researcher-made questionnaire consisted of three sections: 1) guidelines for completing the questionnaire, 2) demographic information, 3) research questions. Using the questionnaire as a data collection tool in quantitative research is always after ensuring the validity and reliability of this tool. Therefore, in the following, we will discuss the validity and reliability of the questionnaire.

Validity measures the desired feature and not another feature (Hooman 1994, 229). In this study, to calculate the content validity ratio (Lawshe, 1975), 13 experts in the field of knowledge and practice of outsourcing were selected. After they agreed to participate, operational definitions and explanations related to the content of the questions were explained, and they were asked to choose appropriateness or inappropriateness of remaining the questions that their presence in the questionnaire.

$$CVR = \frac{n - {}^{N}/_{2}}{{}^{N}/_{2}}$$

where *n* is the number of experts who have chosen the appropriate option, and *N* indicates the total number of specialists and equals 13 in the current study. The minimum acceptable CVR value is determined based on the number of experts who evaluated the questions. In this study, experts are 13, and the content validity ratio equals 0.54. Questions for which the calculated CVR value is less than the desired amount are excluded from the test. Based on the calculated ratios, out of 83 projected items, 78 items were approved, and 5 items were identified as inappropriate. Two were removed of the five inappropriate items, and the other three were modified.

2.4. Population and statistical sample

Those affected by outsourcing were identified in three groups and seven subgroups to determine the statistical population. In the next step, the number of populations affected by outsourcing and the sample size was determined according to the following table of the total questionnaires distributed among the sample of 102 participants (all male). A total of 100 completed questionnaires were collected.

Table 1. Population affected by outsourcing.

Main group	Subgroups	*N*	Sum	Sample size
Internal to the subject	Managers	24	64	18
	Staff representatives	31		23
	Comity on outsourcing	9		7
Upstream officials	Main committee for the outsourcing of National Iranian Gas Company	14	21	10
	Board of National Iranian Gas Company	7		5
Contractors	Potential contractors	6	20	4
	Actual contractors	14		10
Other beneficiaries	-	34	34	25

Table 2. Descriptive data based on work experience.

Work experience (years)	F	%f	Age	f	%f	Education	F	f%
5–15	5	5%	30–45	17	17%	Post-diploma and bachelor's degree	24	%24
16–25	32	32%	45–60	81	81%	MA	64	64%
More than 25	63	63%	>60	2	2%	Ph.D.	12	12%

2.5. Data analysis

After collecting the answers and recording the information, the validity of the variables and the questionnaire were examined using confirmatory factor analysis. The software used was SPSS and Smart PLS. Moreover, the level of error probability (α) was

considered 0.05.

3. Findings

3.1. Normal distribution of research variables

In this section, Kolmogorov–Smirnov and Shapiro–Wilk statistics have been used to investigate the normal distribution of variables.

Table 3. Kolmogorov–Smirnov statistics to check the normality of the distribution of variables.

Variables	Kolmogorov–Smirnov			Shapiro–Wilk			Result
	Statistic	df	(sig)	Statistic	df	(sig)	
Outsourcing management	140.0	99	0.000	927.0	99	0.000	Abnormal
Management of outsourcing risks	115.0	99	0.002	948.0	99	0.001	Abnormal
Organizational rearrangement with an outsourcing approach	088.0	99	0.054	983.0	99	0.207	Normal
Development of outsourcing infrastructures	0.87	99	0.059	980.0	99	0.144	Normal
Implementing outsourcing	0.71	99	0.20	973.0	99	0.041	Abnormal
Outsourcing steps	0.074	99	0.20	979.0	99	0.108	Normal
Outsourcing outcomes	0.100	99	0.015	950.0	99	0.001	Abnormal

In Table 3, it can be seen that the significance level of Kolmogorov–Smirnov and Shapiro–Wilk tests for organizational rearrangement variables, outsourcing steps, and infrastructure development is higher than the error level of 5%; therefore, they have a normal distribution. However, they are not expected since the significance level of variables like management, risk management, outsourcing implementation, and outsourcing outcomes are less than a 5% error level. Because the distribution of some variables is normal, and the distribution of some of them is abnormal, Smart PLS software was used so that the abnormality of the data distribution does not increase the error in estimating the data.

3.2. Check the adequacy of the sample size

Confirmatory factor analysis was used to estimate and validate the research variables, and smart-PLS software was used to investigate the effect of the variables on other variables. The KMO sampling adequacy test was used to determine whether the number of samples was sufficient for factor analysis. The Bartlett sphericity test determines whether the variance of the research variables is influenced by the co-variance of some latent and fundamental factors. In other words, can it be said that the variance of the set of variables is due to a series of hidden and fundamental factors and not all variables?

Table 4. Assessing the adequacy of sampling.

Kaiser–Meyer–Olkin measure of sampling adequacy		0.776
Bartlett sphericity test	Chi-square	3285.85
	df	666
	sig	0.000

According to the information in the table, the values of the Kaiser–Meyer–Olkin measure are close to 1.0, so the sample is sufficient; considering that the significance level of the Bartlett spherical test is less than the error level of 5%, the factor analysis can be used to estimate variables.

Table 5. Examining the factor loads of the questions.

Variable	Primary	Extracted	Variable	Primary	Extracted	Variable	Primary	Extracted	Variable	Primary	Extracted
r1	1	0.878	t6	1	0.933	m10	1	0.888	g4	1	0.96
r2	1	0.927	p1	1	0.895	b1	1	0.916	g5	1	0.821
r3	1	0.883	p2	1	0.935	b2	1	0.896	g6	1	0.816
r4	1	0.915	p3	1	0.909	b3	1	0.934	g7	1	0.89
r5	1	0.931	p4	1	0.812	b4	1	0.858	g8	1	0.946
r6	1	0.966	p5	1	0.887	b5	1	0.918	g9	1	0.924
r7	1	0.943	p6	1	0.935	b6	1	0.914	g10	1	0.929
r8	1	0.854	p7	1	0.921	b7	1	0.902	g11	1	0.952
r9	1	0.891	p8	1	0.94	b8	1	0.868	g12	1	0.912
r10	1	0.923	p9	1	0.96	b9	1	0.907	g13	1	0.921
r11	1	0.932	p10	1	0.915	b10	1	0.892	g14	1	0.96
r12	1	0.847	p11	1	0.897	b11	1	0.889	g15	1	0.893
m1	1	0.856	p12	1	0.926	b12	1	0.813	g16	1	0.877
m2	1	0.928	p13	1	0.908	b13	1	0.924	pb1	1	0.92
m3	1	0.936	p14	1	0.909	b14	1	0.946	pb2	1	0.809
m4	1	0.933	p15	1	0.936	b15	1	0.842	pb3	1	0.895
m5	1	0.932	p16	1	0.873	t1	1	0.94	pb4	1	0.88
m6	1	0.958	p17	1	0.878	t2	1	0.907	pb5	1	0.946
m7	1	0.923	g1	1	0.901	t3	1	0.939	pb6	1	0.923
m8	1	0.936	g2	1	0.937	t4	1	0.895	pb7	1	0.907
m9	1	0.875	g3	1	0.923	t5	1	0.944			

According to Table 5, it can be stated that since the factor or extracted loads of the questionnaire items are at a high level and is close to 1.0, it can be concluded that the questions are at a desirable level to enter the factor analysis.

3.3. Estimating the relationships between research variables

In this step, Smart PLS software is used, and the relationships between the variables are examined via structural equations.

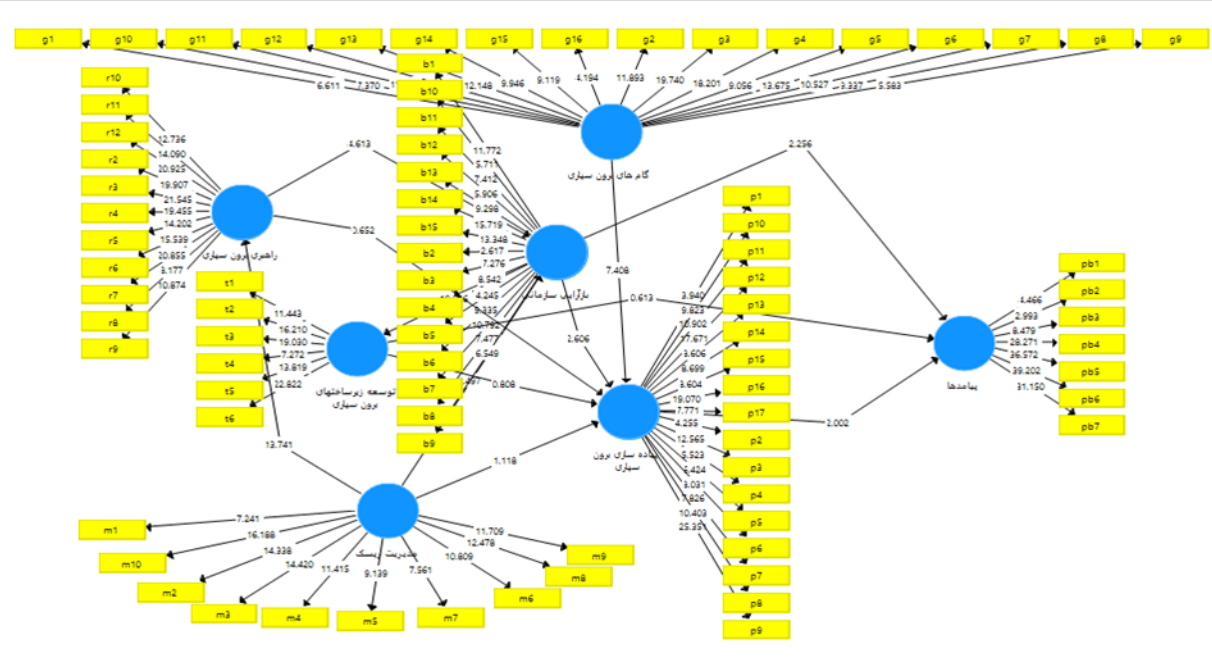

Figure 2. Structural model in t-value.

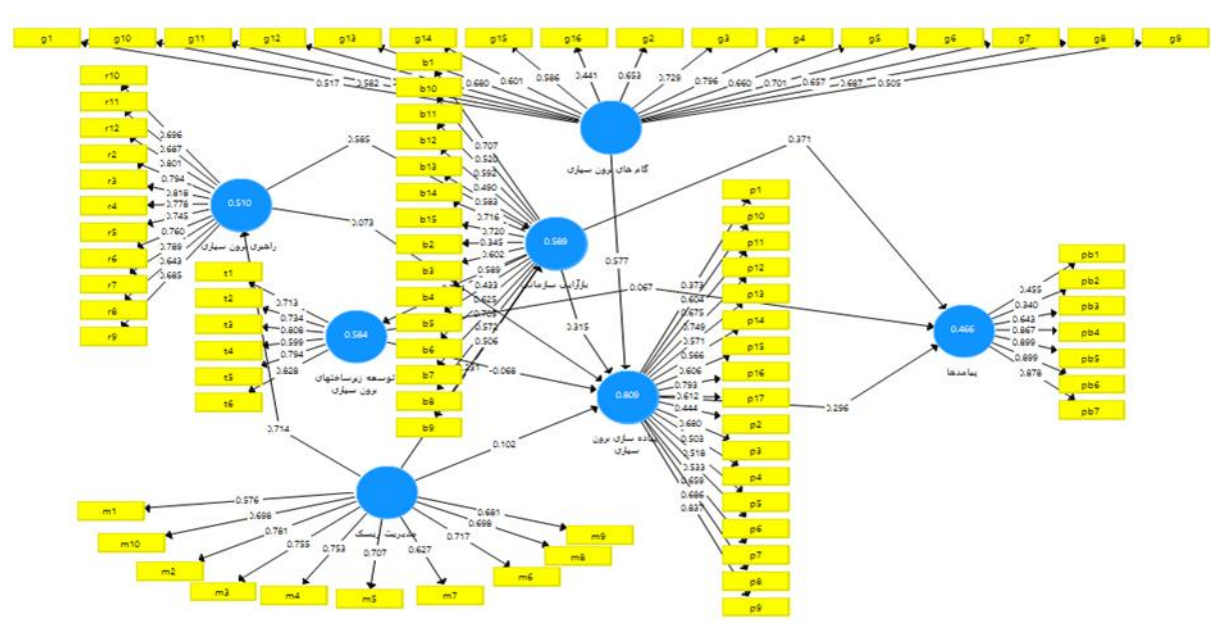

Figure 3. Structural model in the standard coefficient mode.

Figures 2 and 3 show that some variables significantly affect other variables. The relationships of all variables are presented in Table 6.

3.4. Model fit indicators

In the PLS technique, the least-squares are used to fit the model, and usually, the coefficient of determination (R^2), Stone–Geiser index (Q^2), and goodness of fit (GOF) are used.

Table 6. Determination coefficient and Stone–Geiser index.

Variables	R^2	Q^2	Communality	R^2
Organizational arrangement	0.735	0.243	0.250	0.735
Outsourcing infrastructure development	0.502	0.270	0.393	0.502
Outsourcing management	0.672	0.359	0.472	0.672
Risk management	--	--	0.380	--
Outsourcing implementation	0.770	0.285	0.300	0.770
Outsourcing outcomes	0.494	0.262	0.440	0.494
Outsourcing steps	0.309	0.116	0.323	0.309
			0.461	

According to the information in the above table, the coefficient of determination (R^2) of the variables is more than 30%, and the fit of the model is at an acceptable level. Q^2 index (Stone and Geiser 1975) also shows the predictive power of the model in endogenous structures in three values of 15.0, 2.0, and 35.0 as low, medium, and high predictive power, respectively (Hensler et al., 2009). The information in the above table demonstrates that the Aston Geiser index for each of the variables is more than 25%, and it can be stated that the fit of the model is above average and at a reasonable level.

3.5. GOF index

The most important index of the fit of the model in the technique of partial least squares (PLS) is the GOF index. Wetzels et al. (2009) introduced three values of 0.1, 0.25, and 0.36 as weak, medium, and strong values of GOF, respectively. This index can be calculated using the geometric mean of the R^2 index and the mean of the redundancy indices.

$$GOF = \sqrt{\text{age average (Commonality)} \times \text{average } (R^2)}$$

According to Tanenhaus et al. (2005), the GOF index in the PLS model is a practical solution for the general fit of modeling and is like other fit indices in covariance-based models. This index is between zero and one, and values close to one indicate the appropriate quality of the model. According to the above table, the goodness-of-fit criterion of 461.0 is obtained and indicates the optimal fit of the model.

3.6. Testing research hypotheses

Table 7. The test result of main hypotheses.

Hypotheses	Sobel statistic	(β)		Sig	Result
		Direct	Indirect		
Outsourcing management through organizational rearrangement mediator has an impact on outsourcing implementation	2.539	0.073	0.184	0.011	Hypothesis confirmed
Risk management through the outsourcing management mediator affects organizational rearrangement	4.675	0.231	0.417	0.000	Hypothesis confirmed

Hypotheses	Sobel statistic	(β)		Sig	Result
		Direct	Indirect		
Risk management affects the implementation of outsourcing through the mediating variable of organizational rearrangement	1.402	0.102	0.072	0.160	Hypothesis rejected
Organizational rearrangement influences the implementation of outsourcing through the mediating variable of outsourcing infrastructure development	0.845	0.315	0.240	0.397	Hypothesis rejected
Rearrangement through implementation mediator variable affects outcomes	1.69	0.371	0.093	0.090	Hypothesis rejected
Development of outsourcing infrastructure through implementation mediator has an impact on outcomes	0.782	0.067	0.019	0.433	Hypothesis rejected

3.7. Complementary hypothesis

Table 8. The test result of complementary hypotheses.

Hypothesis	T	(β)	sig	result
External management affects organizational rearrangement	4.485	0.585	0.000	Hypothesis confirmed
Organizational rearrangement affects the development of outsourcing infrastructure	20.317	0.746	0.000	Hypothesis confirmed
Organizational rearrangement affects the implementation of outsourcing	2.611	0.315	0.009	Hypothesis confirmed
Risk management affects outsourcing management and organizational rearrangement	12.498	0.714	0.000	Hypothesis confirmed
Risk management affects the implementation of outsourcing	1.522	0.231	0.128	Hypothesis rejected
Infrastructure development affects outsourcing implementation	1.08	0.102	0.279	Hypothesis rejected
Outsourcing steps affect the outsourcing implementation	0.821	–0.068	0.411	Hypothesis rejected
Outsourcing implementation affects outcomes	7.323	0.577	0.000	Hypothesis confirmed

Hypothesis	T	(β)	sig	result
Outcomes affect outsourcing leadership	2.042	0.296	0.041	Hypothesis confirmed
Outsourcing outcomes affect outsourcing management	8.996	0.553	0.000	Hypothesis confirmed
Outsourcing outcomes affect outsourcing risk management	8.522	0.475	0.000	Hypothesis confirmed

4. Discussion

Since the factor or extraction loads of the questionnaire items are at a high level, it is concluded that the questions are at a desirable level to enter the factor analysis and can be used. Factor and software analyses showed that the factor loads of all outsourcing development management indicators were at a high level. Then, the relationships between variables were depicted through structural equations, and the model fit was examined. Regarding the R^2 coefficient, according to the obtained values of the coefficient of determination of variables, the fit of the model is medium to high and at a reasonable level. The Stone–Geiser index for all variables also confirms that the model fits the medium to high and is reasonable. Further, the results demonstrate that the degree of importance of the goodness criterion of the obtained GOF shows the optimal fit of the model.

5. Suggestions

5.1. Practical suggestions for the main theme of outsourcing management

It is suggested that broader and more measures be taken to receive and analyze upstream outsourcing requirements and regulations (0.576) from competent authorities such as the National Iranian Gas Company and the Ministry of Oil. Long-term steps and better and more comprehensive outsourcing approaches can be developed.

Further, possible value-added analysis of outsourcing (0.634) needs special attention; because the activities were previously done internally, it was unnecessary to have a comprehensive analysis of value-added separately in the stages of development and activities.

When the outsourcing approach is implemented, it is proposed that the effectiveness of outsourcing is determined or estimated (service costing system with ABC) at least financially with the help of tools such as industrial accounting, parallel determination of outsourcing products and services, the added value applied by the types of activities, and the production of products and services so as to enable more accurate feasibility and decision making, especially at the strategic level.

5.2. Practical suggestions on the main theme of outsourcing risk management

Management includes identifying, measuring, evaluating, and controlling governance and business risks (0.567). In outsourcing development, management has the most challenges and complexity because risks in this area exist in the architecture of the organization, and the business environments are numerous. Moreover, they may be challenging to identify and measure. Furthermore, taking risk mitigation and control measures in this area requires spending more resources and making extra-organizational coordination. Therefore, it is suggested that future steps of outsourcing be taken by focusing on proper management of these risks.

Further, considering that a significant portion of risks is transferred to outsiders after outsourcing, the activation of risk management mechanisms to assess and adjust for outsourced risks (0.600) can help reduce the likelihood of outsourcing failure. This theme improves the internal capabilities of contractors. To do so, the company needs to have appropriate information and knowledge of its potential and actual contractors and control and mitigate risk, at least in the areas of identification, evaluation, and selection of contractors. Later, the contract should be gained with constructive interaction between the company and the exporter.

5.3. Practical suggestions on the main theme of organizational rearrangement with outsourcing approach

Outsourcing process design or redesign (0.331) is one of the most fundamental steps in institutionalizing outsourcing development management at the company level. However, previous studies have focused more on the individual outsourcing process, which processes the outsourcing portfolio from the strategic planning stage to the outsourcing review and promotion phase, and covers all interactions and criteria. It has been less studied, and it is worthwhile to design it at the current stage and periodically review the parallel stages of outsourcing in the company. The precise definition of this process in the set of the process management system and the failure structure of the company is one of the critical factors in the success of this part of the design and can lead to the precise definition of the regulatory role in outsourcing.

The development of outsourcing monitoring mechanisms (0.475) is an essential and novel category, so it should be appropriately designed. The executive body of the company has more skills in supervising contracts, and if the same supervisory methods are transferred to outsourcing without special considerations, the outsourcing process will be disrupted. Moreover, before outsourcing, the employees of their company were responsible for carrying out their activities, so they might be too involved in outsourcing oversight. Even due to the high turnover of outsourcing, office health should be overshadowed. Therefore, it is suggested that monitoring mechanisms be developed more fully with a regulatory approach and internal controls.

5.4. Practical suggestions on the main theme of development of outsourcing infrastructure

The extent of the impact and scope of outsourcing has placed outsourcing beyond the company's routine outsourcings. As a result, it is suggested that it should be performed in the framework of strategic planning and following the rearrangement and planning to fully operationalize the outsourcing approach in terms of allocating various resources such as hardware and software infrastructure and human, financial, and knowledge resources and mobilize resources and development of outsourcing infrastructure (0.694), with a stronger organizational will.

The operationalization of change management in outsourcing (0.753) is the following suggestion, causing all the necessary changes to be identified, determined, and implemented; responsibilities and schedules to be determined; and the necessary changes to be applied in each outsourcing.

Although there is reliable literature and research background in strategic partnerships and collaborations, the theme of development of strategic outsourcing partnerships and alliances (0.808) in the company requires basic actions and macro-strategic decisions. The network management of these collaborations by covering the interactions between outsiders and even the company's contractors can also lead to the development of internal capabilities, one of the current research goals.

5.5. Practical suggestions on the main theme of outsourcing implementation

Despite the definition of both groups of asset and processes outsourcing in the outsourcing roadmap, and given that operational measures have so far focused on outsourcing of assets, and fewer steps have been taken to outsource processes, there are more tips for outsourcing business processes in interviews and feedback received in the form of questionnaires. Therefore, it is appropriate for the company to use the lessons learned from asset outsourcing to focus and study the accounting or review of requirements and the framework of business process outsourcing (0.356) more and more profoundly to compensate for the existing delays in the process.

5.6. Practical suggestions on the main theme of outsourcing steps

Delivery to the contractor (0.482) is one of the critical topics after selecting the contractor. In other words, the operational connection of the two companies is made in the form of this theme, and at the end of this stage, the contractor must be able to manage the outsourced field. This theme has formal and content differences with temporary and permanent delivery defined in the technical and executive system of projects. It requires careful study and planning and compilation of checklists and explanation of the division of tasks within the employer and between the employer and contractor.

5.7. Practical suggestions on the consequences and review of outsourcing

The limitations and ambiguities of outsourcing, many questions for which definitive answers have not yet been found, and concerns about the development of outsourcing require outsourcing experiences, with their pathology (0.339) to be used to the maximum. With the help of analytical tools, diagnostics, risk management,

and monitoring key indicators and the status of critical factors in outsourcing success, the following steps can create valuable lessons and complete the outsourcing improvement cycle.

Additionally, transferring the recommendations for reviewing upstream outsourcing requirements to decision-making authorities in the National Iranian Gas Company, the Ministry of Oil, the government of the Parliament of Iran (0.461) has continued to gain the attention of experts, and its emptiness has been felt and announced. It is suggested, in particular, that senior management negotiate and play an active role in influencing the imposition of these requirements. Doing so has significant implications in terms of social responsibility, knowledge transfer, and facilitating the implementation of outsourcing strategies in the company, and it removes some administrative and legal barriers to the implementation of outsourcing.

6. Suggestions for future researchers

Given that the following hypotheses were not confirmed in this study, researchers can focus on the following to investigate the cases that can achieve valuable and reliable results and close the gap in research.

- The effect of risk management through the mediating variable of organizational rearrangement on outsourcing implementation;
- The effect of organizational rearrangement through the mediating variable of outsourcing infrastructure development on outsourcing implementation;
- The impact of outsourcing risk management on organizational rearrangement with an outsourcing approach and on outsourcing implementation;
- The impact of outsourcing infrastructure development on outsourcing implementation.

In addition, comparing and examining the relationship and distinctions between outsourcing with other categories of value chain relationship and strategic partnerships, such as contracting and privatization, are still exciting and necessary and at the same time relevant and practical topics for future studies in this field of knowledge.

7. Research limitations

Due to the need for an in-depth analysis in the selected context, the limited scope of the studied field limited the model to the oil and gas industry. The limited number of experts in the field of outsourcing portfolio development and the nature of the questionnaire participants not giving accurate and time-consuming answers were other shortcomings of this work. The epidemic of COVID-19 in the country also limited this study.

References

Embleton, P.R. and Wright, P.C. (1998). A practical guide to successful outsourcing, Empowerment in Organizations, Vol. 6 No. 3, pp. 94–106. https://doi.org/10.1108/14634449810210832.

Eslami, S., Mirghfouri, S.H and Zarei, M., (2016). A Study of the Strategic Role of Outsourcing in Organizational Performance. Global Conference on Management, Accounting Economics and Humanities at the Beginning of the Third Millennium, Shiraz, https://civilica.com / doc / 524885.

Fallah, S.H., Kashif Haghighi, M., and Rezaian, A. (2016). Outsourcing decisions based on MCDM multi-criteria method in construction projects, 3rd International Conference on Science and Engineering. https://civilica.com/doc/491645 .

Henseler, J., Ringle, C. M., and Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In Advances in International Marketing|Adv. Int. Mark. (Vol. 20, pp. 277–319). (Advances in International Marketing). Emerald Publishing Limited. https://doi.org/10.1108/S1474-7979(2009)0000020014.

Hooman, Haidar Ali (1994). Statistical inference in behavioral research. Published by Tehran: Parsa.

ISO 37500. (2014). Guidance on outsourcing. Retrieved from: https://www.iso.org/obp/ui/#iso:std:iso:37500:ed-1:v1:en.

ISO 55000. (2014). Asset management: Overview, principles, and terminology. https://www.iso.org/standard/55088.html.

Jiang, B. and Qureshi, A. (2006). Research on outsourcing results: current literature and future opportunities, Management Decision, Vol. 44 No. 1, pp. 44–55. https://doi.org/10.1108/00251740610641454.

Kakabadse, A. P., and Kakabadse, N. (2005). Outsourcing: current and future trends.

Thunderbird International Business Review, 47 (2), 183–204.

Katato, T., Leelawat, N., and Tang, J. (2020). Antecedents of the Outsourcing Relationship: A Systematic Review. Engineering Journal, 24(4), 157–169.

Kavosh, N. and Chenari, V. (2018). Investigating the Risk Factors of Outsourcing in Khuzestan Gas Company from the Perspective of Information Security, 6th International Conference on Management and Accounting Techniques, Tehran. https://civilica.com/doc/826744.

Lankford, W.M. and Parsa, F. (1999) Outsourcing: A Primer. Management Decision, 37, 310–316. http://dx.doi.org/10.1108/00251749910269357.

Lawshe, C. H. (1975). A quantitative approach to content validity1. Personnel Psychology, 28(4), 563–575.

Linder, J. C., (2004). Outsourcing as a strategy for driving transformation. Strategy and Leadership. 32(6), 26–31.

Mishra, D., Kumar, S., Sharma, R.R.K., and Dubey, R. (2018). Outsourcing decision: do strategy and structure really matter?, Journal of Organizational Change Management, Vol. 31 No. 1, pp. 26–46. https://doi.org/10.1108/JOCM-04-2017-0144.

Nikitakos N; Pirkatis V. (2007). A Framework for IT outsourcing in shipping. researchgate.net/profile/Nikitas-Nikitakos/publication/281494591_A_FRAMEWORK_FOR_IT_OUTSOURCING_IN_SHIPPING/links/55eb536b08ae65b6389deac7/A-FRAMEWORK-FOR-IT-OUTSOURCING-IN-SHIPPING.pdf.

Nourang, A., Drijani, N., Zamanian Jazi, A. (2017). Review the timing of oil and gas EPC projects based on implementation and contract outsourcing strategies. 6th International Conference on Oil, Gas, and Petrochemicals.

Novak, S., Stern, S. (2008). How Does Outsourcing Affect Performance Dynamics? Evidence from the Automobile Industry. Management Science, 54(12), 1963–1979.

Oshri, Ilan, Kotlarsky, Julia, Willcocks, Leslie P. (2015). The Handbook of Global Outsourcing and Offshoring 3rd edition. Palgrave Macmillan UK. 978-1-137-43742-6. XIV, 351.

Perunović, Z., and Pedersen, J. L. (2007). Outsourcing process and theories. In POMS 18th annual conference (Vol. 10).

Rajabzadeh, A., Rostamy, A. A. A., and Hosseini, A. (2008). Designing a generic model for outsourcing process in public sector: evidence of Iran. Management Decision. Vol. 46, No. 4, pp. 521–538.

Seyed Javadin, S.R., Hassangholipour, T. (2011). Outsourcing process. Tehran, Negah Danesh Novin Publishing.

Stone, M., and Geisser, F. (1975). Cross validatory choice and assessment of statistical predictions. Journal of the Royal Statistical Society, 36(2), 111–147.

Tavakoli S., Haghshenas Kashani F., and Amirkabiri A. (2019). Explaining Model of Outsourcing Development Management of Physical Assets in Oil and Gas Industry: A Case Study of Iranian Gas Transmission Company. Petroleum Business Review (PBR), Vol 3, Issue 4.

Tenenhaus, M., Vinzi, V. E. Chatelin, Y-M., and Lauro, C. (2005). PLS Path Modeling, Computational Statistics and Data Analysis (48:1), pp. 159–205.

Tsay, A. A., Gray, J. V., Noh, I. J., and Mahoney, J. T. (2018). A Review of Production and Operations Management Research on Outsourcing in Supply Chains: Implications for the Theory of the Firm. Production and Operations Management, 27(7), 1177–1220. https://doi.org/10.1111/poms.12855.