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Comparing EPC contracts with conventional contracts and their effectiveness on risks of projects in National Iranian South Oil Company

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Abstract. The present research aims at comparing the joint design-build contracts with conventional contracts and their effectiveness on risk of projects in National Iranian South Oil Company. This research is a practical and descriptive type. The library and field methods were used for data collection. The researchers made use of self-made questionnaires which include 55 questions. These questions are designed to include the performance indicators basics of major industrial projects. The answering scale of questionnaire is a 5scale Likert type. The statistical population of this research includes all managers and experts of Iranian South Oil Company who are involved in engineering and implementing the oil and gas projects. The number of subjects exceeds 180 people. 123 subjects were selected as samples based on Cochran formula. Because, some teste's might have left a question unanswered or because of some mistakes regarding the questionnaires, 123 questionnaires were distributed, 115 of which were collected and analyzed. The samples were selected through systematic sampling. The descriptive statistics (frequencies, mean, deviations) were used for special data and inferential statistics were used for testing the hypotheses (ANOVA , T test, Bonferroni test). The main hypothesis and all of the subsidiary hypotheses were confirmed.

Keywords: EPC project, conventional project, risk, contractor, employer

1. INTRODUCTION

The projects are often dynamic and prices are estimated based on the expert's best expectations. Besides, regarding what seems to be decisive, the estimation should contain the probable events. The second part of estimation is related to probable events and project's risk analysis. Risk of a project is actually the chance of an unfavorable occurrence with all of its unfavorable outcomes. Determining and analyzing the risks of projects allows the managers and beneficiaries of the project to confidently go forward the project. Identifying the unknowns and uncertainties of a probable project help not being dropped behind the goals (i.e. materializing the costs, time and quality of the projects based on what was expected). Regarding the importance of project's risks and their impacts on efficiency of organizations, the present research tried to compare the EPC contracts with conventional contracts; moreover it tried to analyze the effectiveness of contracts on project's risks in National Iranian South Oil Company.

1.1. Statement Of The Problem

In competitive environment, there's a lot of pressure on delivering the results of projects as soon as possible. Today, multiples elements must be taken into consideration to achieve a project and expected goals.

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For a long time, implementing a project used to be done through two elements (employer and contractor). During the 1900,(when complexities and knowledge of design were increased specially after the second world war) the three-elements method (employer, advisor, contractor) was developed for implementing such projects. This method was used by educated engineers. During the 70^{s} -80^{s}, execution management was developed as a changed version. During the mid -90^{s}, a two-element method was prevalent as "joint design-build". By the 21s, this method was regarded as an optimize solution for implementing some projects. In design-build method, the contractor should supply goods and equipment needed for building. Moreover, he has the duty of conducting comparative design studies. A developed version of this method is called EPC.

1.2. Importance of the study

The oil projects are very valuable because they have a wide range and they are very important for the guidelines they provide. Their high value of exchange and Rial redoubles the importance. These issues which are mostly considered as national issues have special complexities regarding the influential management of elements such as resources, time and costs. Finally, the projects should be delivered with an acceptable high quality.

Science and technology developments in utilizing the fossil fuel makes it possible for the researchers to deliver their results in due time with a specified costs and a proper quality. In this regard, the only possible way for practitioners of this industry is utilizing new methods for project management in order to bring forth the investments and creating new opportunities regarding the infrastructure projects of oil industry. Based on some researches done by organizations and experts, using a suitable method for implementing the projects can decrease at least 5 percent of major project's costs and 35 percent of execution time. In this regard, doing the present research and finding the results is very important since, Iranian South Oil Company plays a strategic role in oil industry of the country and its huge executive projects are valuable. Since, the risk of projects and types of contracts are very important, we compared the EPC contracts with conventional contracts. Moreover, we analyzed their effectiveness on project's risks of Iranian South Oil Company.

1.3. Research hypotheses

Main hypothesis:

The EPC method is more suitable for implementing major projects of national South Oil Company in terms of dimensions, costs, time, quality and risk.

Subsidiary hypotheses:

1. Implementing the projects by EPC methods has a shorter scheduling compared to conventional method.

2. Implementing the projects by EPC methods requires less costs compared to conventional method.

3. Implementing the projects by EPC methods requires maintaining the quality and performing the projects in a more favorable way in the set up phase.

4. Implementing the projects by EPC methods has less responsibilities and risks for the employer.

1.4. The Review Of The Literature In Iran

1.4.1. Researches in Iran

- Haj Bagheri and Sadeghi (2011) in their research analyzed the status of risks management in manufacturing industry of Iran.

The manufacturing projects are always prone to various risks. If these risks could not be managed correctly, they might lead to operation decrease or even to projects failure. Therefore, utilizing the knowledge of risk management is essential for reaching a favorable operation. This researcher analyzed the status of risk management in Iran's manufacturing based on process of risk management by PMBOK standard (risk management plan, risks identification, qualitative analysis of risk, quantitative analysis of risk, risk responses plan, risks follow up and control). The data were collected from questionnaire derived from sets of small, average and big companies active in country's manufacturing. The results of this research describe the practical use of risk management for country's manufacturing. The research can be used as a base for risk management studies of different countries manufacturing or of different industries.

- Khosravani et al (2011) studied the submission of project management services by manufacturing contractors.
  Each organization is directed in a certain way with respects to its features, leadership style and management. It also uses different methods for their various actions. Outsourcing or asking for consultation in different procedures is one of these methods. Outsourcing means the action of sharing some internal actions and giving right of making the related decisions to outside suppliers. According to Cleland, outsourcing is an extensible groundwork for project management. Davidson also believes that the simplest type of outsourcing is using an advisor for doing things. There are considerable numbers of studies about using the outsourcing in manufacturing activities of products; but, unfortunately there are a very limited numbers of studies focused on outsourcing the services and especially on project management services. But, what's the relationship between outsourcing and management advising, what subjects of project management and to what extend they are submitted by contractors to suppliers are to be investigated.
  The present research suggests a table for answering such questions which can be used as guidelines for contractors.

1.4.2. The review of the related literature (abroad):

Researches (abroad)

- Hochbaum and Wagner (2015) studied the contract range :sharing risk and beyond.

Infrastructure projects usually encounter with a various range of risks. These risks include, the risk associated with all the permissions required by building (including the permissions associated with environmental projects), the delay in construction, costs goes beyond the

anticipated budget, availability and quality of services, uncertainty about the time of project implementation and changes in value of assets. The private and public partnership has such main risks. The difference between private-public partnership and traditional financial security of projects is that private-public partnership allows the government to significantly share lots of risks between itself and the private sector. At the same time, a bad designed private-public partnership can be a high risk for government due to its long-term contractual provisions.

The main principle of risk sharing is that every risk should be accepted by a sector which is able to manage it efficiently. For example, the risks associated with building and utilizing must be allocated by private sector and, government must accept to control these risks. These types of risks are political and regulatory and government can reduce them by political stability and avoiding constant changes of laws. The government can also exert its influence on demand and rates of exchange.

- Becker and Smidt (2015) studied the risk associated with human resources in projects associated with contingent workforce.
  Managers of human resources play a positive and influential role in organizational performance. Today, human resources management participates in designing the strategies of organizational business. The human resources management has the responsibility to coordinate the human resources with organizational projects. This role is associated with activities such as planning, selecting, appointing and firing the workforce.

There are a large number of studies about human resource management in the organizations. However, few studies have been conducted on risk management of human resources in project-oriented organizations. Project-oriented organizations are encountered with risk of human resource and if they lose an employee, they lose their priorities as well. This type of risk is associated with the personnel policies of a company such as recruitment, education, motivation and maintaining the employees. The risk of human resource comes in various forms such as risk of losing a precious employee, risk of inadequate or wrong motivation of management staff, etc. If the personnel are educated enough and have a high degree of commitment, every environmental fluctuation or other factors would affect an organization with the smallest possible quantity. Comparing to other organizations, the project-oriented organizations face many challenges and special issues. These issues may affect the human resource management pattern of these organizations and consequently, requires special actions and processes of human resources. The conceptual model is presented in this research based on the properties of project-oriented organizations.

1.5. Calculating the sample size by Cochran formula

Cochran formula comes in two different forms for definite and indefinite statistical population. Because the sample of the present research is definite, the following formula is used:

$$n = \frac{t^2.p.q.N}{d^2(N-1) + t^2.p.q}$$

N represents the statistical population and t is the constant number. The product of p and q is standard deviation and their sum is equal to 1. Despite the fact that the standard deviation is not available in the present research, 0.5 is suggested for q and p because it offers the maximum sample size with minimum error.

D is the p value which is equal to 0.05

N is the sample size

Therefore, according to the following formula, the sample would be equal to 123.

$$n = \frac{(1.96)^2 \times 0.5 \times (\ 180\ \ 0}{(0.0025) + (1.96)^2 \times 0.5 \times 0.} \quad 123$$

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Because, some teste's might have left a question unanswered or because of some questionnaires mistakes, 123 questionnaires were distributed, 115 of which were collected and analyzed. The samples were selected through systematic sampling. The names of employees were arranged in alphabetical order. Two subjects were selected out of three. From the first 3 subjects, two subjects were selected randomly and the rest were selected by two distances after the selected subject.

1.6. Instruments

There are various methods for data collection and in order to gather information of a research, more than one method is mostly used. The field method was used for data collection of the present research. Questionnaire is one of the most common ways for collecting data in this method. The researcher tried to find the information through planning some questions.

The answering scale of questionnaire is a 5scale Likert type. The questions are ordered in such a way that the scores above 3 (the average response) represents the efficiency of EPC performance indicators over conventional indicators and lower scores represents the efficiency of conventional indicators over those of EPC.

The distributions of questionnaire's indicators are shown in table 1. One important thing about this questionnaire is the way questions are aligned and distributed.

Table 1. The overall shape and scoring of the questionnaires regarding the conventional method – EPC method comparison.

Completely disagree	Disagree	Not disagree- not agree	Agree	Completely agree
1	2	3	4	5

Table 2. The overall shape and scoring of the range of project's risk.

Completely disagree	Disagree	Not disagree- not agree	Agree	Completely agree
1	2	3	4	5

1.7. Analyzing the statistical population

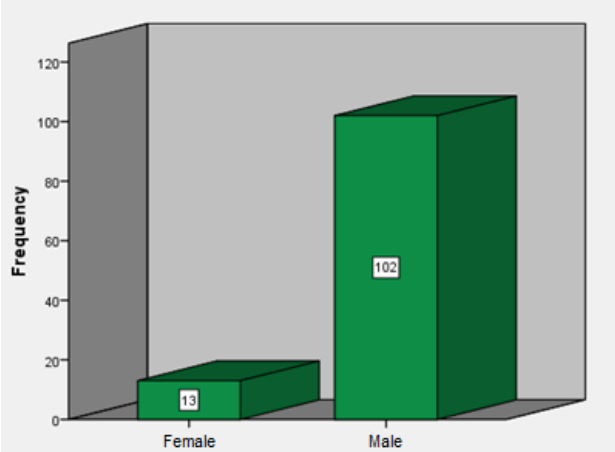

Figure 1. The percentage of studied samples based on gender.

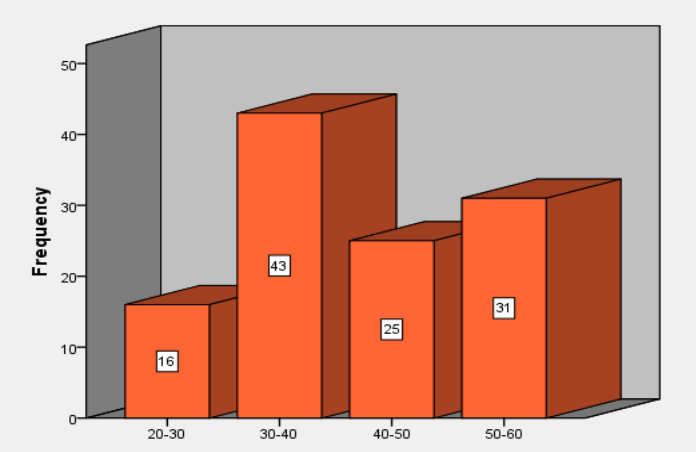

Figure 2. The percentage of studied samples based on age.

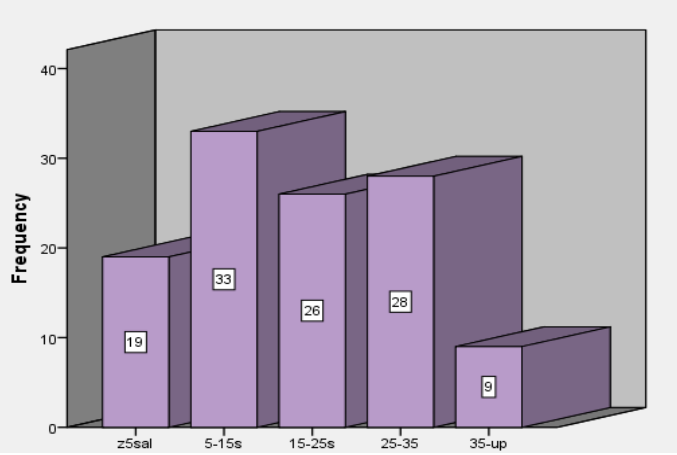

Figure 3. The percentage of studied samples based on educational level.

Table 3. The mean and standard deviation of sample's scores, frequencies and distributions of answers and statistical measure of time variable.

row	Research questions		The superiority of conventional method in terms of performance indicators		The sameness of both methods in terms of indicators	The superiority of EPC method in terms of performance indicators		Mean	Standard deviation	coefficient of variation
1	The overlap of tender time of design and building in EPC method	Frequency	5	18	23	52	17	3.5	1.063	0.30
		Percentage	4.3	15.7	20.0	45.2	14.8			
2	Late start of execution operations in conventional method because of necessity of supplying goods beforehand	Frequency	2	16	15	54	28	3.78	1.024	0.27
		Percentage	1.7	13.9	13.0	47.0	24.3			
3	Prolonged supplying of goods in conventional method due to the regulations of the legal requirements	Frequency	8	24	21	56	6	3.24	1.065	0.32
		Percentage	7.0	20.9	18.3	48.7	5.2			
4	The conventional method's more efficient structure in supplying goods	Frequency	4	38	25	38	10	3.10	1.071	0.34
		Percentage	3.5	33.0	21.7	33.0	8.7			
5	Faster resolving of obscurities and executive changes in EPC method	Frequency	6	14	18	61	16	3.58	1.043	0.29
		Percentage	5.2	12.2	15.7	53.0	13.9			
6	Being a linear process of activities in the conventional method and concatenation of delays	Frequency	2	13	12	64	24	3.83	0.984	0.26
		Percentage	1.7	11.3	10.4	55.7	20.9			
7	Shorter period of time needed for completion of the project through EPC method	Frequency	3	15	13	66	18	3.70	0.973	0.27
		Percentage	2.6	13.0	11.3	57.4	15.7			
8	Efficiency at the time of choosing an advisor in EPC method	Frequency	0	16	22	64	13	3.64	0.860	0.24
		Percentage	0	13.9	19.1	55.7	11.3			
9	Increase of speed in EPC method because of possibility of unified systems	Frequency	0	13	27	53	22	3.73	0.901	0.24
		Percentage	0	11.3	23.5	46.1	19.1			
10	The possibility of supplying goods wholly in EPC method	Frequency	2	19	21	58	15	3.57	0.975	0.27
		Percentage	1.7	16.5	18.3	50.4	13.0			
11	Greater stability of the project scheduling application in EPC method	Frequency	1	23	30	53	8	3.83	0.914	0.24
		Percentage	0.9	20.0	26.1	46.1	7.0			
12	More coordination between the designer and builder in EPC method	Frequency	1	20	31	48	15	3.49	0.958	0.27
		Percentage	0.9	17.4	27.0	41.7	13.0			
13	Avoiding doing actions again and again in EPC method because of earlier arrival of building agents	Frequency	2	19	32	51	11	3.41	0.987	0.29
		Percentage	1.7	16.5	27.8	44.3	9.6			
14	Project's time reduction in EPC method due to the reduction in bureaucracy of buying.	Frequency	0	11	22	69	13	3.73	0.787	0.21
		Percentage	0	9.6	19.1	60.0	11.3			
15	Basic assurance about the efficacy of EPC in terms of project's time reduction	Frequency	2	20	42	42	9	3.31	0.912	0.27
		Percentage	1.7	17.4	36.5	36.5	7.8			
Total								3.53	0.51	0.14

Table 4. The mean and standard deviation of sample's scores, frequencies and distributions of answers and statistical measure of cost variable.

row	Research questions		The superiority of conventional method in terms of performance indicators		The sameness of both methods in terms of indicators	The superiority of EPC method in terms of performance indicators		Mean	Standard deviation	coefficient of variation
16	Certainty about cost estimation in EPC method	Frequency	7	24	35	42	7	3.16	1.022	0.32
		Percentage	6.1	20.9	30.4	36.5	6.1			
17	Reduced cost of changes and lawsuits in EPC method	Frequency	10	29	29	44	3	3.01	1.047	0.35
		Percentage	8.7	25.2	25.2	38.3	2.6			
18	Conventional cost increase due to the possibility of revision in the design	Frequency	4	26	29	50	6	3.24	0.979	0.30
		Percentage	3.5	22.6	25.2	43.5	5.2			
19	The lack of increase in costs in EPC method due to the range	Frequency	1	16	19	58	21	3.71	0.935	0.25
		Percentage	0.9	13.9	16.5	50.4	18.3			
20	Cost reduction in EPC method because of parallel work and avoiding the duplication	Frequency	4	16	23	58	14	3.54	0.994	0.27
		Percentage	3.5	13.9	20.0	50.4	12.2			
21	Reduction claims for overtime in EPC method due to the range of contractor's commitments	Frequency	3	11	27	63	11	3.59	0.887	0.25
		Percentage	2.6	9.6	23.5	54.8	9.6			
22	Reduction of projects costs in EPC method due to reduction in bureaucracy of goods	Frequency	1	16	28	57	13	3.57	0.900	0.25
		Percentage	0.9	13.9	24.3	49.6	11.3			
23	Previous trust to efficiency of EPC method in terms of project's cost	Frequency	3	24	35	42	11	3.30	0.991	0.30
		Percentage	2.6	20.9	30.4	36.5	9.6			
Total								3.39	0.61	0.18

Table 5. The mean and standard deviation of sample's scores, frequencies and distributions of answers and statistical measure of quality variable.

row	Research questions		The superiority of conventional method in terms of performance indicators		The sameness of both methods in terms of indicators	The superiority of EPC method in terms of performance indicators		Mean	Standard deviation	coefficient of variation
24	Paying attention to the functional features of the project in EPC method	Frequency	4	11	26	60	14	3.60	0.944	0.26
		Percentage	3.5	9.6	22.6	52.2	12.2			
25	More coordination between the triplet processes in EPC method	Frequency	2	9	12	80	12	3.79	0.800	0.21
		Percentage	1.7	7.8	10.4	69.6	10.4			
26	Maintaining the work quality due to the employer's quality control in EPC method	Frequency	6	13	22	59	15	3.56	1.028	0.29
		Percentage	5.2	11.3	19.1	51.3	13.0			
27	The existence of more security for maintaining the	Frequency	3	15	30	58	9	3.48	0.911	0.26
		Percentage	2.6	13.0	26.1	50.4	7.8			

	quality of work in EPC method									
28	access to value engineering and the transfer of technical knowledge in EPC method	Frequency	2	6	35	60	12	3.64	0.808	0.22
		Percentage	1.7	5.2	30.4	52.2	10.4			
29	Access to several design options in EPC method	Frequency	0	12	31	60	12	3.63	0.811	0.22
		Percentage	0	10.4	27.0	52.2	10.4			
30	Previous trust to efficiency of EPC method in terms of project's quality	Frequency	3	21	45	44	2	3.18	0.844	0.26
		Percentage	2.6	18.3	39.1	38.3	1.7			
Total								3.52	0.50	0.14

1.8. Analyzing data of risk variable

The distribution of comments and measuring "risk" variable is shown in table 4-4 and they will be analyzed in the following table.

Table 6.

row	Research questions		The superiority of conventional method in terms of performance indicators		The sameness of both methods in terms of indicators	The superiority of EPC method in terms of performance indicators		Mean	Standard deviation	coefficient of variation
31	Transferring the whole risk by employee in EPC method	Frequency	0	8	23	66	18	3.82	0.779	0.21
		Percentage	0	7.0	20.0	57.4	15.7			
32	The responsibility of the contractor in an insurance coverage in EPC method	Frequency	1	5	22	67	20	3.87	0.779	0.20
		Percentage	0.9	4.3	19.1	58.3	17.4			
33	The responsibility of contractor to maintain the quality of the installations after Setup in EPC method	Frequency	4	19	20	53	19	3.56	1.061	0.30
		Percentage	3.5	16.5	17.4	46.1	16.5			
34	More risk of contractor in EPC method regarding the level of design	Frequency	0	7	18	77	13	3.83	0.700	0.18
		Percentage	0	6.1	15.7	67.0	11.3			
35	The employer's light responsibility for functioning and processing in EPC method	Frequency	0	19	15	57	24	3.75	0.972	0.26
		Percentage	0	16.5	13.0	49.6	20.9			
36	The contractor's lack of responsibility for performing equipment set up in conventional method	Frequency	13	38	25	37	2	2.80	1.070	0.38
		Percentage	11.3	33.0	21.7	32.2	1.7			
37	The responsibility of builder for designing errors of EPC method	Frequency	0	21	24	51	19	3.59	0.972	0.19
		Percentage	0	18.3	20.9	44.3	16.5			
38	Reducing the official-management responsibility of the employer's in EPC method	Frequency	3	16	16	65	15	3.63	0.967	0.26
		Percentage	2.6	13.9	13.9	56.5	13.0			
39	Fixed price and inflexibility of the performer in EPC method	Frequency	1	6	37	66	5	3.59	0.700	0.19
		Percentage	0.9	5.2	32.2	57.4	4.3			
40	The existence of a coherent and efficient organization for	Frequency	0	17	33	55	10	3.50	0.852	0.24
		Percentage	0	14.8	28.7	47.8	8.7			

	purchasing goods in EPC method									
41	The contractor's high practical and financial capability	Frequency	2	16	21	58	18	3.64	0.996	0.27
		Percentage	1.7	13.9	18.3	50.4	15.7			
42	The contractor's experience in doing projects with EPC method	Frequency	0	17	25	53	20	3.66	0.936	0.25
		Percentage	0	14.8	21.7	46.1	17.4			
43	The lack of ambiguity and the transparency of the project by EPC method	Frequency	0	23	17	60	15	3.58	0.955	0.26
		Percentage	0	20.0	14.8	52.2	13.0			
44	The lack of ambiguity in responsibility of the projects by EPC method	Frequency	1	33	34	39	8	3.17	0.958	0.30
		Percentage	0.9	28.7	29.6	33.9	7.0			
45	Determining the actual rationale for the executive costs by the contractor in EPC projects	Frequency	0	23	24	56	12	3.50	0.931	0.26
		Percentage	0	20.0	20.9	48.7	10.4			
46	Providing sufficient and experienced human force for doing EPC projects	Frequency	2	21	19	59	14	3.54	0.958	0.27
		Percentage	1.7	18.3	16.5	51.3	12.2			
47	Having a comprehensive and executable program in EPC method	Frequency	0	23	32	51	9	3.40	0.896	0.26
		Percentage	0	20.0	27.8	44.3	7.8			
48	Having a proper training program and enhancing knowledge of human resources in EPC projects	Frequency	0	21	39	49	6	3.35	0.838	0.25
		Percentage	0	18.3	33.0	42.6	5.2			
49	Sudden changes in tax and other tariffs in EPC projects	Frequency	3	14	26	68	4	3.49	0.852	0.24
		Percentage	2.6	12.2	22.6	59.1	3.5			
50	Increasing the wages and benefits of executive personnel in EPC projects	Frequency	2	11	38	59	5	3.47	0.798	0.23
		Percentage	1.7	9.6	33.0	51.3	4.3			
51	Poor advice and novice human resources	Frequency	2	16	22	57	18	3.63	0.967	0.26
		Percentage	1.7	13.9	19.1	49.6	15.7			
52	The lack of coherence of the detailed engineering and the lack of performance details in EPC projects.	Frequency	4	24	27	52	8	3.31	0.994	0.28
		Percentage	3.5	20.9	23.5	45.2	7.0			
53	The lack of precision in estimating time and costs in EPC projects	Frequency	2	18	28	58	11	3.49	0.931	0.26
		Percentage	1.7	15.7	24.3	48.7	9.6			
54	Contractor's lack of understanding about work in EPC projects.	Frequency	2	22	31	42	18	3.54	1.028	0.29
		Percentage	1.7	19.1	27.0	36.5	15.7			
55	More unpredictable activities in EPC projects	Frequency	3	16	32	47	17	3.51	0.994	0.28
		Percentage	2.6	13.9	27.8	40.9	14.8			
Total								3.52	0.42	0.12

Table 7. The results of analysis of variance by repeated measures on the variables of time, cost, quality and risk.

The source of changes	Sum of changes	Degree of freedom	Mean squares	Factor(f)	p-value
Indicators	5.30	3	1.76	18.03	0.0001
Errors	33.20	339	0.098		-

Table 8. The results of Bonferroni test on variables of time, cost, quality and risk.

Factors		Mean	1-time	2- cost	3.quality	4. risk
1	Time	3.535		0.002	0.0001	
2	Cost	3.389				0.004
3	Quality	3.520				0.0001
4	Risk	3.525				

Table 9. The results of t test of one group for comparing the mean of statistical sample with performance indicators.

Variable	Mean	Standard deviation	Average of criterion	Degree of freedom	Observed t	p-value
Analyzing the efficiency of risk in EPC and conventional methods	3.501	0.392	3	114	90.57	0.000

1.8.1. Testing the first subsidiary hypothesis

Implementing the projects by EPC methods has a shorter scheduling compared to conventional method.

Table 10. The results of t test of one group for calculating the mean of statistical sample regarding time indicator.

Variable	Mean	Standard deviation	Average of criterion	Degree of freedom	Observed t	p-value
Analyzing the efficiency of time in EPC and conventional methods	3.535	0.506	3	114	74.90	0.000

1.8.2. Testing the second subsidiary hypothesis:

Implementing the projects by EPC methods requires less costs compared to conventional method.

Table 11.The results of t test of one group for calculating the mean of statistical sample regarding cost indicator.

Variable	Mean	Standard deviation	Average of criterion	Degree of freedom	Observed t	p-value
Analyzing the efficiency of cost in EPC and conventional methods	3.389	0.608	3	114	59.68	0.000

1.8.3. Testing the third subsidiary hypothesis:

Implementing the projects by EPC methods requires maintaining the quality and performing the projects in a more favorable way in the set up phase.

Table 12. The results of t test of one group for calculating the mean of statistical sample regarding quality indicator.

Variable	Mean	Standard deviation	Average of criterion	Degree of freedom	Observed t	p-value
Analyzing the efficiency of quality in EPC and conventional methods	3.550	0.497	3	114	76.67	0.000

1.8.4. Testing the forth subsidiary hypothesis:

Implementing the projects by EPC methods has less responsibility and risks for the employer.

Table 13. The results of t test of one group for calculating the mean of statistical sample regarding risk indicator.

Variable	Mean	Standard deviation	Average of criterion	Degree of freedom	Observed t	p-value
Analyzing the efficiency of risk in EPC and conventional methods	3.525	0.416	3	114	90.68	0.000

2. RESULTS OF THE STUDY

Main hypothesis: The EPC method is more suitable for implementing major projects of national South Oil Company in terms of dimensions, costs, time, quality and risk.

First subsidiary hypothesis: Implementing the projects by EPC methods has a shorter schedule compared to conventional method.

Second subsidiary hypothesis: Implementing the projects by EPC methods requires less costs compared to conventional method.

Third subsidiary hypothesis: Implementing the projects by EPC methods requires maintaining the quality and performing the projects in a more favorable way in the set up phase.

Implementing the projects by EPC methods has less responsibility and risks for the employer.

3. THE EFFICIENT MODEL

In this model, the dependent variables (cost, time, quality and risk) are compared based on the impact of EPC and conventional methods (independent variables) and the possibility of choosing one of them as a more efficient method is represented.

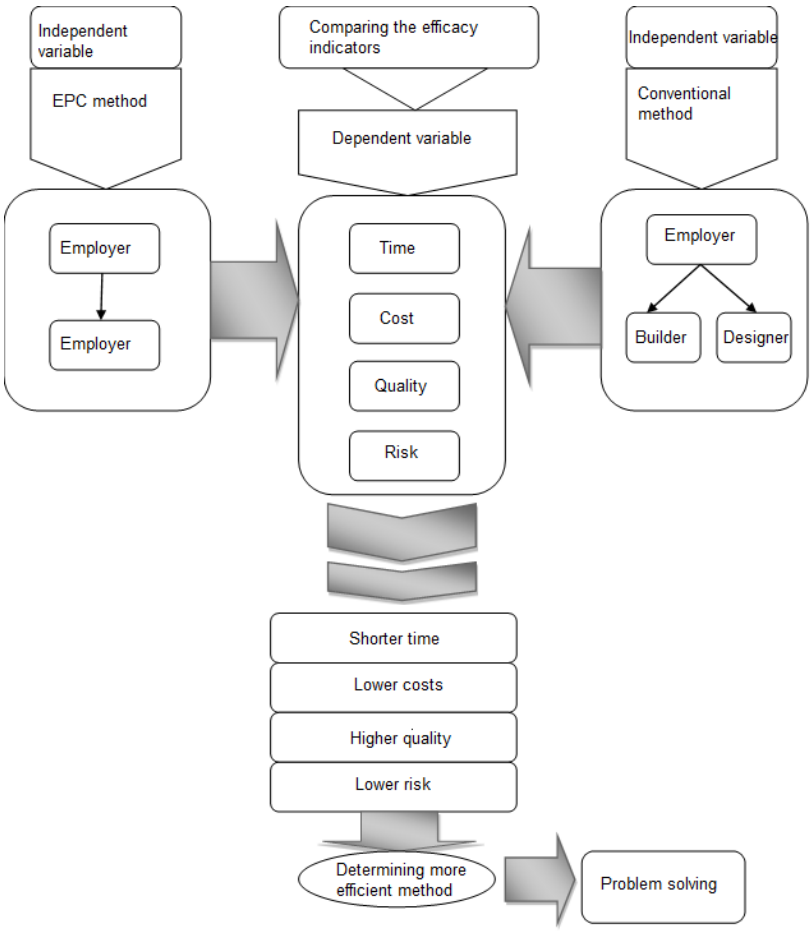

Figure 4. The Efficient Model

4. DISCUSSIONS AND CONCLUSIONS

Based on the presented analyzes along with the theories of the research, the research tried to compare two methods (EPC and conventional methods) in terms of accessing to shorter schedule, lower costs, higher quality and lower risk. It also tried to create a proper balance between time, cost, quality, and risk because it's a necessity for a project success.

Because the project's environmental conditions are not stable, the suggested facts (i.e. time, cost, quality, and risk) are changing over and over. Therefore, resolving the main part of barriers in order to make them more efficient and balanced is impossible.

As it was discussed earlier, the aim of the present research is comparing the joint design-build contracts with conventional contracts and their effectiveness on risk of projects in National Iranian South Oil Company. In this regard, the concept of project as well as risk were taken into consideration and then the study focused on comparing the joint design-build contracts with conventional contracts and their effectiveness on risk of projects in National Iranian South Oil Company. The research also tried to answer a question: which method is more suitable for implementing the major projects of South Oil Company in terms of dimensions, cost, time, quality and risk?

The results of the research confirmed the main hypothesis. It means that EPC method is more suitable than conventional method for implementing the major projects of South Oil Company

in terms of dimensions, cost, time, quality and risk. Implementing the industrial projects in South Oil Company is more efficient and superior than conventional method. The result of the research is in line with Taghi Zadeh and Saghi's (2011) findings. Choosing a proper method for projects implementation can decrease 5 percent of projects costs and 35 percent of execution time. However, choosing an inappropriate system to implement the projects can lead to problems such as delay, cost increase, disagreements and claims regarding the projects. This decision which is made in the very beginning phase of the project affects its procedures and finally its efficiency.

The results of the study confirmed the first subsidiary hypothesis. It means that implementing the projects by EPC methods has a shorter schedule compared to conventional method. The result of this study is in line with the findings of Farshad far (2011), Mohammad Nejad , et al (2009). Moreover, the second subsidiary hypothesis was confirmed. It means that implementing the projects by EPC methods requires less costs compared to conventional method. These findings are in line with findings of Zarin (2010) , Mohammad Nejad et al (2009). The third subsidiary hypothesis was also confirmed. It means that implementing the projects by EPC methods have more quality and performance compared to conventional method. These findings are in line with Kendrick's (2003) findings. Finally, the results of the research confirmed the forth subsidiary hypothesis. It means that implementing the projects by EPC methods has less responsibility and risks for the employer. These findings are in line with Mortahab and Shams' (2007) findings.

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