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Lack of Time on Projects and an Attempt to Compensate It Increasing Labor and Machinery Work Time and Its Relationship to Future Costs of the Project

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Abstract- Delays would have various effects including increased project time, increased direct and indirect costs, missing the predetermined objectives and lost opportunity costs as the consequence. These problems can cause disagreements among the project stakeholders or claims and in some cases, has led to cases at legal courts, all of which requires time, cost and energy consumption. Therefore, it is essential to study these processes and provided proper solutions to recognize and analyze the causes, reasons and factors affecting delays and how to manage it. Findings based on data collected from questionnaires along with their analysis and implemented tests on final questionnaire were examined. The presence of unpredicted factors at construction process and related difficulties has made it impossible to prevent delays at projects and since any delay can cause extra costs for those involved at project, it is always necessary to determine the effect of time and imposed losses for all those involved at the construction due to delays conducting a precise analysis and also calculate the time extension.

Keywords- *Project Time, Direct and Indirect Costs, Delays at Projects, Time Extension*

I. INTRODUCTION

Time is the crucial and important part of construction and design contracts. However, there may be delays or failure to complete the project within the time agreed in the contract due to a series of measures by the contractor or employer, or both (3). At time approach, any delay is considered as a serious risk and problem for project objective. According to contractors, delay would cause prolonging the execution of the contract, the rising cost of materials due to inflation and increased cost of labor, equipment and overall higher order costs. Higher order costs include management and organization costs of the project based on the contract issue and development of the company due to providing official and support services for operation and workshop activities impost on the contractors. The cost of the workshop include the expense of monitoring, the cost of holding workshop, facilities, tools, equipment, machinery and transport which are all imposed on the contractors. Thus, finishing the project at the due time indicates efficiency and high technical skill of the contractors (6). The present study examined the following hypotheses. First, it identifies the factors causing delays and provided proper solutions to manage the problems due delays at engineering construction projects which can help accurate management of the projects. Using weak operational elements at projects due to holding tenders based on low costs and the dominance of financial suggestion on technical suggestion leads to delay. Reducing the causes and factors affecting delays at engineering projects by preparation and construction would cause reduction in project costs. Reduced delays at designing, preparation and operation phases would improve the operation of these projects. The necessity for privatization, cooperation and investment of the private sector were also examined at the present study.

II. RESEARCH PURPOSE

The main purpose of the present study is to examine the financial and economic feasibility, demands of areas at external regions, which are high industries, to identify and examine the factors affecting delays at engineering projects based on preparation-construction (EPC), and to identify and examine the delays and provide solutions to reduce delays. Accordingly, other objectives would also meet through questionnaires. Further, finally the effect of these factors on the main purpose of the study which is the time, cost and quality of projects is examined using a survey (4). What is clearly distinct the projects, it the presence of some features and characteristics which due to their nature and during various process affect the study, design and implementation phases of a project. The features include high operational volume and projects credit compared to other civil projects, some limiting factors including specific regional and climate features, location, traffic and interference of various urban activities with the project, necessitate the importance of paying more attention to the investment risk compared to other projects due to high operational volume, long operation period and the possibility of various unpredicted issues and problems at the time of operation. Further, considering the safety measures at the time of operation and to prevent accidents are the cases which show

the importance of the issue. As there is not study on the issue in Iran, it is thus necessary to examine the delays and identify the causes and also to provide some strategies to reduce the delays (6).

III. Background of Delays in Contracts Based on Logistics and Construction Method

Akhavani et al (2007) examined the issue of examining the causes of delay at contracts for the logistic and construction contracts. They believe that various types of delays at logistic and construction projects are (1):

a) Undue delays: a series of factors and specific conditions at construction and plan projects cause delay which are out of control by the contractor.

b) Unreasonable delays: these types of delays happen due to not correctly and duly performance of the obligations by the contract parties which led to a series of mistakes and improper performance by those involved at the project.

c) Recoverable delays: some delays are recoverable by correct planning and precise control over the project or due correction and modification instead of mistakes or by allocation of resources during a specific time.

d) Irrecoverable delays: delays which cannot be recovered by control or planning and cause increased costs and outdating technology.

Furthermore, according the review of literature, the factors affecting delays in these projects include (2):

A main part of project delays is related to changes which happen at the time of working due to physical condition of the project and is due to imprecise and unrealistic calculations. If the project engineering is done properly, it would prevent many problems at word and some of delays. Contractors can reduce the project costs by having proper preliminary studies and would facilitate operational activities. He can also prepare comprehensive maps which do not need any revision at the time of work to facilitate the operational activities and prevent any increase at costs. Delays are caused by weak information system to the project manages and project control section to the engineering teams and also weak transmission of data and information, communication and coordination and send recent reviews. Correct planning and management of human resources including organization of human force at various times and parts of the project, providing expert personnel at engineering section, absorption and maintenance of active and experienced forces, contact bonus system, organize proper determination of salary and benefits system and other facilities, and the overall organizational structure suitable for the contractor would significantly decrease the delays (7).

Chan and Kumarasomi (2002) examined the density (decrease) due to the experiences gained during the construction of Hong Kong's construction projects. The study examined the reasons for delays at developed and developing countries and it was found that incorrect estimation and design, weak project management and lack of materials, improper water and climate and human force performance are considered as the most important reasons for delays at developing countries.

IV. Review of Related Literature

Today the process of operating projects in Iran has improved significantly and is welcomed due to its main advantages which is trust regarding the final cost and finishing time of the plan. The important point regarding the selection of project operation method is to consider the provision of required infrastructure to implement them (14). Therefore, if the project requires, EPC design and construction method can be a proper method for the project provided that there are the required infrastructures for the country. Otherwise, this method would fail as other three-element method (client, consultant and contractor) which lacked any content and technical mistake. The present study, regarding the review of literature on project management and construction, examines the project operation methods and delays, their types and data analysis using survey. After collecting the questionnaire, the data are collected using strong software of SPSS so that it can reduce these factors and consequently disagreements and legal issues based on the findings.

Delphi technique was used to examine the views of a experts on a specific issue such as examining the viewpoint of the university professors on a new educational issue.

There are various types of questionnaire including those with open questions, short answers, articles, descriptive and explanatory. The present study used SPSS software for data analysis, field questionnaire for data collection, TOPSIS ranking or 5-point Likert scale of very low, low, average, high and very high (following table). It should be mentioned that non-linear criterion is used for proper distinction of factors for linear criteria and the related effects. These numerical values are:

TABLE I. NUMERICAL WEIGHT OF REPSONSES FOR PROBABILITY AND EFFECT OF EACH FACTOR

Factor probability	Very low	10 %	Effect of each factor	Very low	5 %
	Low	30 %		Low	10 %
	average	50 %		average	20 %
	High	70 %		High	40%
	Very high	90 %		Very high	80%

V. Research Questionnaire and Questions

Questions are the main elements of a survey. Their quality would affect the related data more effectively than other parts of the process.

TABLE II. PROJECT ELEMENTS AND DELAY FACTORS

Project factor	Ratio				
	0.8	0.4	0.2	0.1	0.05
Effect of delay on costs	Price changes more than 80% of the contract value	Price changes 40-80% of the contract value	Price changes 40-20% of the contract value	Price changes 20-10% of the contract value	Price changes less than 10% of the contract value
Effect of delay on Time	Price changes more than 80% of the contract time	Price changes 40-80% of the contract time	Price changes 40-20% of the contract time	Price changes 20-10% of the contract time	Price changes less than 10% of the contract time

VI. RESEARCH POPULATION AND FIELD SURVEY PROCESS

As two questionnaires are used in the study, it should be mentioned that the first questionnaire is used for evaluating the causes and factors of time delay. The data collected after sending the questionnaires to the active companies and the results are provided in next section. Finally 20 contractors' active at construction and planning with the experience of performing or investing at these projects responded. Accordingly, the appropriate numbers of questionnaires were provided. Then, they were distributed among the consultant, contractor and investment companies activating at construction and planning sector. The collected data were then analyzed so that the effect of each factor on time, cost and quality would be evaluated.

VII. QUESTIONNAIRES AND DATA ANALYSIS

Surveys are flexible. There can be a lot of questions about specific topics and they significantly increase the flexibility of the analysis. This makes it possible to realize the actual observations as the operational definition (12). Survey has advantages in terms of low cost and the amount of data and the data that are collected. Standard data collected represents one of the strengths of survey research. After sending the questionnaires for the first time to the active companies at construction and planning to identify which factors are more effective on delay at projects, 20 contractors' active at construction and planning with the experience of performing or investing at these projects responded. Accordingly, the appropriate numbers of questionnaires were provided. Then, they were distributed among the consultant, contractor and investment companies activating at construction and planning sector. The collected data were then analyzed, the results of which are provided at questionnaire table (7).

VIII. DESCRIPTIVE STATISTICS

Table 3 shows the descriptive statistics based on the phase. As it is seen, engineering and planning phase has the highest probability (8).

TABLE III. DESCRIPTIVE STATISTICS OF COLLECTED QUESTIONNAIRE BASED ON PHASE

Descriptive statistics					
phase	N	min	max	mean	SD
Design and engineering	32	3.78	4.33	4.0617	.13839
logistics	32	3.94	4.22	4.0730	.07831
Construction	32	3.61	4.17	3.9306	.12621

IX. RELIABILITY TEST DATA

At this section, Cronbach alpha is used to examine the reliability for three phases of the projects. After removing the unreliable data, it is required to examine the reliability of the responses (9). For this purpose, the test responses are analyzed using SPSS V.14 software. According to data analysis, if the Cronbach alpha coefficient is higher than 0.9, it indicates high reliability. If it is higher than 0.8, reliability of data is at good level. Reliability of over 0.7, over 0.5 and less than 0.5 indicate acceptable, weak and unacceptable coefficients, respectively.

As it is observed, alpha coefficient is more than 80% which indicates the good reliability of the statistic data. There were totally 10 factors causing delay at construction phase, the results of which are mentioned in the following table.

TABLE IV. DATA RELIABILITY FOR ENGINEERING AND DESIGN PHASE

Data	
Cronbach Alpha	N of factors
0.804	10

There were totally 15 factors causing delay at construction phase, the results of which are mentioned in the following.

TABLE V. DATA RELIABILITY FOR LOGISTIC PHASE

Data	
Cronbach Alpha	N of factors
0.769	15

As it is observed, alpha coefficient is more than 70% which indicates the acceptable reliability of the statistic data. There were totally 23 factors causing delay at construction phase, the results of which are mentioned in the following.

TABLE VI. DATA RELIABILITY FOR CONSTRUCTION PHASE

Data	
Cronbach Alpha	N of factors
0.593	23

As it is observed, alpha coefficient is more than 50% which indicates the reliability of the statistic data.

X. The Probability and Effect of Each Factor (One Sample T test)

One sample t-test on SPSS software was used for this purpose. Variance analysis is based on the analysis of component distribution (variance). Further, it is required to know that what categories can be determined based on significance of the population (10). Duncan test is used for this purpose. It should be mentioned that Duncan test and goodness of fit examine the responses in two ways. Goodness of fit determined that the responses are not distributed which questions the correctness of the questions and non-significance. However, Duncan test recognizes that there is an acceptable distribution and if there can be categories to show the significance of various viewpoints. The probability of delay for each phase is provided, respectively. Thus the consequence of each 48 recognized factor is provided. It should be noted that following symbols are used for each 48 factors to be used for each delay factor. The factors related to various phases are provided in table 7 as below.

TABLE VII. CLASSIFICATION AND ASIGNEMENT OF THE SYMBOL Y TO BETTER IDENTIFY CAUSES OF DELAY IN THE DIFFERENT PHASES

	Factors related to the design and implementation phase
Y1	Of employing and hiring expert
Y2	Technical weakness of the Engineer in coordination between consulting engineers and contractors and resolving technical problems and timely implementation of the project
Y3	Lack of proper coordination between the Employer and the Contractor (design consultant)
Y4	inadequate procedure
Y5	Accountability delayed Engineering Contractors (consultant) to the required changes in the maps and during project implementation (lack of coordination and cooperation necessary to execute the engineering section)
Y6	Transfer the project to the company by a consortium composed of several contractor
Y7	Failure to determine the exact amount of the materials or the omission of goods in the list provided by the engineering department for procurement projects
Y8	Errors and mistakes in drawing) such as: mistake with the size, type and material items included in the map, etc.)
Y9	Engineering sector due to prolonged delay in starting the hiring process and prepare engineering team project
Y10	Delayed response to changes in requirements engineering sector employer in the drawings and project documents
	Factors related to the preparatory phase
Y11	Failure to identify the status of negotiations and remaining sanctions and its impact on the cost of the project due to the high rate of exchange
Y12	Lack of foreign investment professional contractors in EPC projects due to lack of economic stability in Iran
Y13	Administrative bureaucracy within the organization employer
Y14	Failure to recruit qualified and experienced contractor in the logistics business
Y15	Iran sanctions by some countries
Y16	The impact of government programs and legislation on the activities of the supply of goods (for example, prevent imports of a particular product that is required for the project)
Y17	Unpredictable inflation rates and increased material prices compared to the rates and estimating project costs
Y18	To see the prices unrealistically) low (at the time of bidding by contractors, with the aim of winning the tender
Y19	Delays in collection of receivables contractor by the employer
Y20	Weak-financed contract
Y21	Changes in exchange rates
Y22	Preparation of materials without proper quality
Y23	Failure to provide required materials list has been prepared on the basis of engineering projects (such as failure to provide adequate and consistent with BOM)
Y24	Failure to follow the product preparation phase problems by project managers
Y25	The delay in sending the carriage of goods by suppliers and depreciation / material damage during transportation
	Factors related to construction and implementation phase
Y26	Limit the list of suppliers material (Vendor List) by the national oil company and the obligation to supply emanates from them
Y27	Select manufacturers and suppliers lack of experience and poor contractor
Y28	The long duration of opening an account and activate letters of credit (LC)
Y29	Problems clearance and prolong the clearance
Y30	Lack of qualified and experienced staff employed by contractor
Y31	The poor performance of the Office of Technical Inspection
Y32	Delays in collection of receivables contractor by the employer
Y33	Select subcontractors and less experienced employees due to the low rate of wages by the contractor
Y34	Poor organization and lack of suitable project control procedures
Y35	Client project managers and experts engaged in more than one project and the lack of sufficient focus on this project
Y36	The lack of adequate financial resources as well as spending budget project non-project activities referred to by the contractor
Y37	Delays in projects resulting from tools, equipment and contractor
Y38	Inclement weather such as rain, wind, dust, etc.
Y39	Delays in follow-up issues, and solve problems (internal and external) of the project managers employer
Y40	Shortage of manpower contractor to carry out all the activities referred to in Schedule and inappropriate and inefficient allocation of personnel working on several fronts by contractor
Y41	Lack of proper coordination between the employer and the contractor
Y42	Provided by the employer as working poor (lack of transparency and lack of duty items listed in the job description)
Y43	Risk of environmental projects and delays in securing the location for the project

XI. Probability Chart of Each Factor

The probability of each factor is provided to examine the possibility of each phase. As it is known, the highest delay happened at design and engineering time due to lack of response by the consultant to the changes at maps and at the time of project operation.

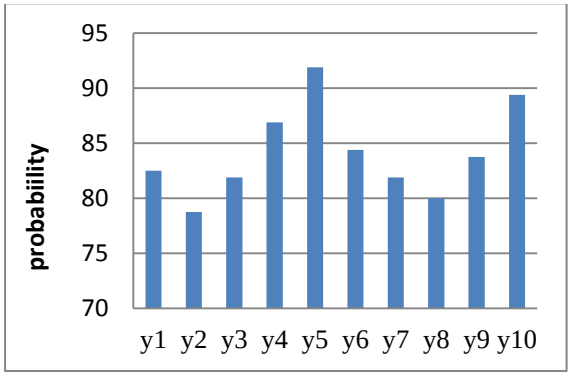

Figure 1. The probability of factors related to the design and engineering phase

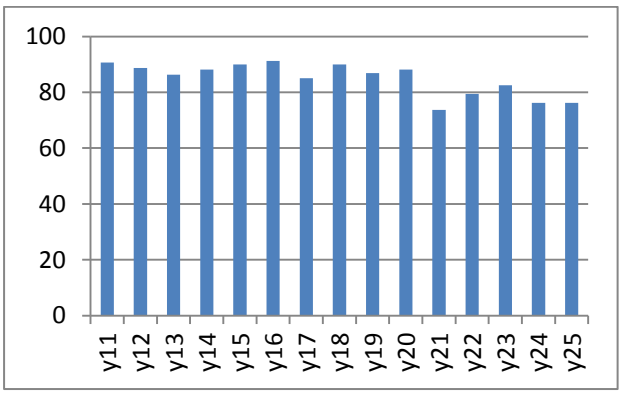

Figure 2. The probability of factors related to the logistic phase

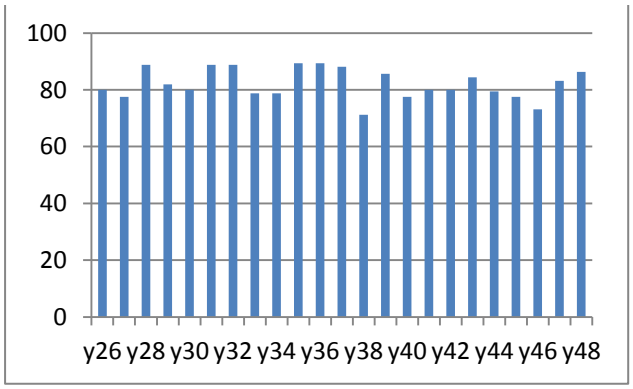

Figure 3. The probability of factors related to the construction phase

Regarding figures 2-4 and 3-4, it is obviously known that at logistic phase, all the factors have same effect on project delay. Failure to identify the status of nuclear negotiations and remaining sanctions and the impact on the cost of the project and the lack of specific programs and government regulations such as the decision hasty and complex conditions nuclear talks to other factors, the have relatively higher impact on delays.

XII. THE EFFECT OF A VARIETY OF GOALS OVER PROJECT

To study the impact of each factor on project objectives, including time, cost and quality of the project, the values of the probability of each of them is given in figure (4-4) to (4-6). Looking at the chart we can see that all delay factors in most cases affected project cost and time.

Figure 4. The effects of design and engineering phase (blue columns is time effect, red columns is cost effect, green columns is quality effect)

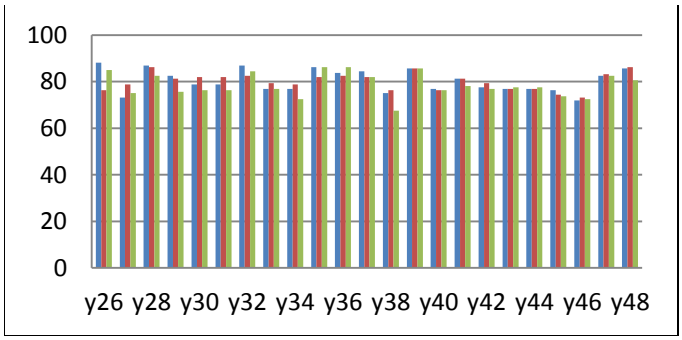

Figure 5. The effects of construction and implementation phase (blue columns is time effect, red columns is cost effect, green columns is quality effect)

XIII. PRIORITIZING THE DELAY CAUSE BASED ON PROBABILITY

In this section, tables 8, 9 and 10 shown factors with the highest effect on the project time, project cost and project quality respectively.

TABLE VIII. FACTORS WITH THE HIGHEST EFFECT ON THE PROJECT TIME: 10 MORE IMPORTANT FACTORS

A variety of factors affecting the projects in order of importance
Limit the list of suppliers material (Vendor List) by the national oil company and the obligation to supply emanates from them
Delayed response to changes in requirements engineering sector employer in the drawings and project documents
The impact of government programs and legislation on the activities of the supply of goods (for example, prevent imports of a particular product that is required for the project)
Delays in collection of receivables contractor by the employer
Engineering sector due to prolonged delay in starting the hiring process and prepare engineering team project
The long duration of opening an account and activate letters of credit (LC)
Delays in collection of receivables contractor by the employer
Client project managers and experts engaged in more than one project and the lack of sufficient focus on this project
To see the prices unrealistically) low (at the time of bidding by contractors, with the aim of winning the tender
Delays in follow-up issues, and solve problems (internal and external) of the project managers employer

TABLE IX. FACTORS WITH THE HIGHEST EFFECT ON THE PROJECT COST: 10 MORE IMPORTANT FACTORS

A variety of factors affecting the cost of the project in order of importance
Accountability delayed Engineering Contractors (consultant) to the required changes in the maps and during project implementation (lack of coordination and cooperation necessary to execute the engineering section)
Lack of foreign investment professional contractors in EPC projects due to lack of economic stability in Iran
Failure to identify the status of negotiations and remaining sanctions and its impact on the cost of the project due to the high rate of exchange
The long duration of opening an account and activate letters of credit (LC)
Delays in decision-making and disposition of land to the project site by the employer rebels
See the procedure (Procedure) inadequate
To see the prices unrealistically) low (at the time of bidding by contractors, with the aim of winning the tender
Delays in follow-up issues, and solve problems (internal and external) of the project managers employer
Delayed response to changes in requirements engineering sector employer in the drawings and project documents

TABLE X. FACTORS WITH THE HIGHEST EFFECT ON THE PROJECT QUALITY: 10 MORE IMPORTANT FACTORS

A variety of factors affecting the quality of the projects in order of importance
Lack of foreign investment professional contractors in EPC projects due to lack of economic stability in Iran
Failure to recruit qualified and experienced contractor in the logistics business
The lack of adequate financial resources as well as spending budget project non-project activities referred to by the contractor
Client project managers and experts engaged in more than one project and the lack of sufficient focus on this project
Failure to provide required materials list has been prepared on the basis of engineering projects (such as failure to provide adequate and consistent with BOM)
Preparation of materials without proper quality
Delays in follow-up issues, and solve problems (internal and external) of the project managers employer
Of employing and hiring expert
Limit the list of suppliers material (Vendor List) by the national oil company and the obligation to supply emanates from them
Lack of foreign investment professional contractors in EPC projects due to lack of economic stability in Iran

XIV. THE RESULTS OF NUMERICAL ANALYSIS OF THE CAUSES OF DELAYS IN EPC PROJECTS

According to the independent variables and the likely effect on any causes of delay, one can use the concept of mathematical expectation, $\sum p(x) \times I(x)$. That is, the PI is calculated from the perspective of each responden and then the mean PI is calculated. While calculating the average P and I mean of any factors and the final multiplication can be done also. Both methods were used to analyze the factors and there is a significant difference in response rate and OS were observed. The following tables show the numerical and qualitative analysis of the results. In this table, the effect on each of the goals of time, cost and quality separation is bulging. Or the number in the last column of the product of the probability of the corresponding (cost, time and quality) is achieved. According to the results presented in these tables, it can be estimated that the effectiveness of each of these factors is presented in the tables.

TABLE XI. NUMERICAL ANALYSIS OF FACTORS RELATED TO THE DESIGN AND ENGINEERING PHASE

Delay factor	(p)probability	(t)mean time	(c)mean cost	(q)mean quality	Mean(p)* Mean(t)	Mean(p)* Mean (c)	Mean(p)* Mean(q)
y1	0.825	0.825	0.806	0.856	0.681	0.665	0.706
y2	0.788	0.788	0.719	0.725	0.620	0.566	0.571
y3	0.819	0.813	0.838	0.781	0.665	0.686	0.640
y4	0.869	0.831	0.863	0.838	0.722	0.749	0.728
y5	0.919	0.863	0.888	0.656	0.792	0.815	0.603
y6	0.844	0.819	0.819	0.781	0.691	0.691	0.659
y7	0.819	0.800	0.769	0.825	0.655	0.629	0.675
y8	0.800	0.806	0.769	0.681	0.645	0.615	0.545
y9	0.838	0.869	0.825	0.731	0.728	0.691	0.612
y10	0.894	0.875	0.850	0.775	0.782	0.760	0.693

TABLE XII. NUMERICAL ANALYSIS OF FACTORS RELATED TO THE IMPLEMENTATION PHASE

Delay factor	(p)probability	(t)mean time	(c)mean cost	(q)mean quality	Mean(p)* Mean(t)	Mean(p)* Mean (c)	Mean(p)* Mean(q)
y26	0.800	0.881	0.763	0.850	0.705	0.610	0.680
y27	0.775	0.731	0.788	0.750	0.567	0.610	0.581
y28	0.888	0.869	0.863	0.825	0.771	0.765	0.732
y29	0.819	0.825	0.813	0.756	0.675	0.665	0.619
y30	0.800	0.788	0.819	0.763	0.630	0.655	0.610
y31	0.888	0.788	0.819	0.763	0.699	0.727	0.677
y32	0.888	0.869	0.825	0.844	0.771	0.732	0.749
y33	0.788	0.769	0.794	0.769	0.605	0.625	0.605
y34	0.788	0.769	0.788	0.725	0.605	0.620	0.571
y35	0.894	0.863	0.819	0.863	0.771	0.732	0.771
y36	0.894	0.838	0.825	0.863	0.749	0.737	0.771
y37	0.881	0.844	0.819	0.819	0.744	0.722	0.722
y38	0.713	0.750	0.763	0.675	0.534	0.543	0.481
y39	0.856	0.856	0.856	0.856	0.733	0.733	0.733
y40	0.775	0.769	0.763	0.763	0.596	0.591	0.591
y41	0.800	0.813	0.813	0.781	0.650	0.650	0.625
y42	0.800	0.775	0.794	0.769	0.620	0.635	0.615
y43	0.844	0.769	0.769	0.775	0.649	0.649	0.654
y44	0.794	0.769	0.769	0.775	0.610	0.610	0.615
y45	0.775	0.763	0.744	0.738	0.591	0.576	0.572
y46	0.731	0.719	0.731	0.725	0.526	0.535	0.530
y47	0.831	0.825	0.831	0.825	0.686	0.691	0.686
y48	0.863	0.856	0.863	0.806	0.739	0.744	0.695

XV. PRIORITIZING THE FACTORS BASED ON IMPORTANCE LEVELS

In this study, the factors with the PI greater than 75% are of high importance (High), factors with PI greater than 70% were of moderate importance (Moderate) and the factors with the PI less than 70% have low importance (lOW) and are accordingly classified.

TABLE XIII. RANKING OF FACTORS RELATED TO LOGISTIC PHASE BASED ON THE LEVEL OF IMPORTANCE

Delay factor	P mean * time p	P mean * cost p	P mean * quality p
y11	HIGH	HIGH	LOW
y12	MODERATE	HIGH	HIGH
y13	LOW	MODERATE	LOW
y14	MODERATE	LOW	HIGH
y15	MODERATE	HIGH	MODERATE
y16	HIGH	MODERATE	HIGH
y17	LOW	MODERATE	LOW
y18	HIGH	HIGH	HIGH
y19	HIGH	MODERATE	MODERATE
y20	MODERATE	MODERATE	LOW
y21	LOW	LOW	LOW
y22	LOW	LOW	LOW
y23	LOW	LOW	MODERATE
y24	LOW	LOW	LOW
y25	LOW	LOW	LOW

XVI. RANKING THE IMPORTANCE OF VARIOUS FACTORS USING AHP-TOPSIS

In this section to determine the importance of delays in the project, using Analytical Hierarchy Process (AHP) as the most powerful method of filling in decision-making, multi-criteria and a comparison of the agents with respect to their effects are compared. Compared to a couple of factors (to the effect) of the desired weight is achieved. In this regard, the overall operating table is formed for each category in the first row and first column of the causes of delay in the project will be included in that category. After the formation of the index table any option to decide are compared to the other two options (comparison test), and this action continues until the table is formed. The proportionality coefficients of each factor ranking are calculated as Table (4-15).

TABLE XIV. FIT COEFFICIENT AND RANKINGS OF EACH FACTOR

fit coefficient and rankings of each factor	Ranking factors
0.677	Time
0.674	Cost
0.655	Quality

TABLE XV. RANKING OF FACTORS RELATED TO CONSTRUCTION PHASE BASED ON THE LEVEL OF IMPORTANCE

Delay factor	P mean * time p	P mean * cost p	P mean * quality p
y26	MODERATE	LOW	LOW
y27	LOW	LOW	LOW
y28	HIGH	HIGH	MODERATE
y29	LOW	LOW	LOW
y30	LOW	LOW	LOW
y31	LOW	MODERATE	LOW
y32	HIGH	MODERATE	MODERATE
y33	LOW	LOW	LOW
y34	LOW	LOW	LOW
y35	HIGH	MODERATE	HIGH
y36	MODERATE	MODERATE	HIGH
y37	MODERATE	MODERATE	MODERATE
y38	LOW	LOW	LOW
y39	MODERATE	MODERATE	MODERATE
y40	LOW	LOW	LOW
y41	LOW	LOW	LOW
y42	LOW	LOW	LOW
y43	LOW	LOW	LOW
y44	LOW	LOW	LOW
y45	LOW	LOW	LOW
y46	LOW	LOW	LOW
y47	LOW	LOW	LOW
y48	MODERATE	MODERATE	LOW

Thus, using Topsis and ranking of major in the Annex (Excel file), the end result of a variety of factors are ranked as Table (4-16). So, following can show a variety of factors in order of preference as Table. During this research, the other purposes, including identify causes of delay in this project by preparing a questionnaire addressed and ultimately to determine the effects of these factors on 3 main aims of the project's time, cost and quality projects are evaluated using survey and ranking them based on Topsis (14).

XVII. RESULTS AND CONCLUSION

Company or organization that runs the project through construction plan need not necessarily to have all the features needed to design and implement the project. In EPC, design project from basic design to detailed design and supply all the materials and equipment in different parts of the project includes equipment and materials as well as running and setup procedure is performed by the contractor. International Federation of Consulting Engineers (FIDIC), this method is known as planning engineering design projects and execution of turnkey method. Due to the circumstances that the country is due to the fact that in terms of financing the development of infrastructure there are problems, moving officials toward new methods of privatization, especially in the oil industry in recent years, the power industry become prevalent in the authorities

also tried to be concise introduction to any new contracts to be found. Important criteria for project selection methods can be time, cost, client satisfaction and project definition named. Although in the world, methods and tools to determine the way the project has been prepared in two ways, one based on the value on each of the criteria the employer and others based on empirical knowledge and undertake similar projects act. Yet in most parts of the world, the choice of criteria is done based on the success of previous projects and experience of the employer. However, in some cases, it is emphasized to choose the right contractor and his experience.

To risk the lack of adequate funding for the project at the right time and the delay in the payment of contractors based on the frequency distribution, verbal Expressions items fail to factor in the risk of occurrence of failure 11 experts have evaluated this factor too much and most people 9. On the verbal statements in accordance with the distribution of risk factors likely to discover items failure, 2 experts evaluated this factor no warning of high risk and high-risk 5 with warning and 11 too high and 1 high and 1 as medium. Regarding the frequency of the verbal statements in accordance with the distribution of risk factors likely to discover items failure, 3 experts evaluated this factor is quite impossible, 4 people very unlikely and 7 and 1 low and 1 average. In addition, in accordance with the frequency of words and word about the importance of risk factors, the importance of the event of the failure of the three experts middle and 11 high and 2 very important factor in the severity of the failure, 1 have evaluated intermediate, 7 high 8 high and regarding the importance of risk factors likelihood of failure and 5 considered it as high and 3 very high. Unforeseen factors and problems in the manufacturing process prevent the occurrence of delays in carrying out projects has become impossible and since the occurrence of any delay in implementing the projects. It can cause additional costs for the agents involved in the project and it is always a sense of urgency that in the case of delay, the effects damages imposed on each of the factors involved in the manufacturing process and extended time is calculated with a detailed assessment. It was observed in the process of doing research, then develop and provide various analytical techniques and sharing project delays that are used in the world today and enumerates the strengths and weaknesses of each, prerequisites and limitations to use any of them according to available records and policy managers were examined. Documentation, logs, records and dates of beginning and end are required for the activities during project implementation. Design and development of databases in this regard can be very efficient and useful. It is for certain that delays in almost all projects in this country, have occurred especially projects of every year, so it is worth considering the increasing importance of time management in projects, the use of research in this regard to No solutions to newer, more accurate and more practical to fit the events and problems of the country have been planned to be resolved. . Since the proposed methodology for measuring the contribution of activities, different criteria are considered effective physical progress; as a result, this method is offered as a logical part of activities. So to estimate the physical progress of the project will be more in tune and consistent with reality.

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