Identification, Evaluation and Classification of Time Delay Risks of Construction Project in Iran

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Abstract

Delay has negative effects on different aspects of a project, including time, quality, cost and safety. In the projects with long-term delays, the plan lose its economic justification, which may cause terminated projects, if the executor was private sector or decrease quality and safety to prevent more financial loses, if the executor was public sector. Negative effects of delay in projects include legal problems between employer, contractor and consultant; decrease of productivity and revenue; unfinished large projects. The present article tries to provide a questionnaire from three perspectives of public owner (10 companies), contractor (10 companies) and private consultant (15 companies) in order to find out reasons of delay in construction projects and identify reasons with more risks in the projects, considering Probability and Severity of the reasons and also follow up structural origin of intrinsic whether the problem relates to public strategic planning or organizational and systematic problems and/or shortage of project management knowledge may cause delay in the construction projects.

Keywords:
Project management, Construction project, Delay factors

Introduction

Relative independence in securing technology and constructional materials and tools is one of the advantages of the country's economy that in addition to a tremendous contribution to gross domestic product, it supports main part of employment. Iranian economy includes a great public section about %50 of centralized economy (Press TV, January 28, 2010). Main part of exportation in Iran (about %80) is allocated to exportation of petroleum and gas. In 2010, the exportation formed %60 of the governmental revenue (Economist, Jan 16th 2003). The unique thing about Iranian economy is portion of cultural foundations from central government budget, includes %30 of the budget (Globalsecurity, 2011). Iranian graduated population, economic inefficiency and domestic and foreign inadequate investment result in increasing growth of migration that cause brain drain (Gheissari, 2009). International Monetary Fund (IMF) predicted growth rate in Iran as %0, on May 2011; but, after objection of Iran, it increased the rate to %2.5, which is less than global and regional average growth rate. International Monetary Fund reports that in 2011, inflation in Iran was the highest in the Middle East, as %22.5 (Barajas, 2011).

In 2012, the inflation rate was %32 according to the Central Bank of Iran and %29, according to Statistical Center of Iran. Regarding theory of liquidity and the formula MV=PY, where M is volume of liquidity, V is velocity of cash flow in the society, P is production and Y is inflation or price, the best method of decreasing inflation is increase of domestic product. One of the best productive options in Iran is housing production, which is done as Mehr Housing Plan. This will result in decrease of inflation, increase of employment and finally, economic growth (Minsky, 2008). Central portal of Statistical Center of Iran reports that 67,565 construction permits are issued in Iran to build constructions in 2012, but success of these projects depends on a pyramidal structure that may endangers the plans to be economical and/or operational (Statistical Center of Iran website, 2012). The critical economic situation and the major role of construction project in Iran GDP[1]caused growth attention on successful project completion. This paper is dealing with the risk of delay in projects and the way of managing them.

[1] Gross Domestic Production

Delay in project has negative role in different aspects of a project such as time, quality, cost and safety. Therefore, negative effects of delay in projects are: legal problems between owner, contractor and consultant; decrease of productivity and revenue; termination of large projects. The present paper evaluates similar studies about the countries of the region and other countries that are similar to Iran in cultural, economical and/or regional aspects. First, it identifies delay reasons in construction projects, and then identifies the factors and their risks in Iran by field study and distributing a questionnaire between 32 representatives of public and private companies, including 12 consultants, 10 contractors and 10 owners. After identification of time risks of construction projects and their evaluation, it is worth specifying problem levels to identify root causes, in order to determine the factors that the project manager is responsible for and suggest an appropriate solution to improve the problems, considering the standards and/or guidelines of project management (PMBOK 2008 edition).

Delays happen in most construction projects, whether simple or complex. Construction delay could be defined as the time overrun Time period that is either beyond the contract date or beyond the date that the parties agreed upon for delivery of a project or a service to customer (Assaf SA, Al-Hejji S, 2006). This time is also called project sleep time that is a big problem in all kind of projects. From the owner's view, delay in project means losing revenue, because if construction project was a business, the owner's revenue comes later and if it was non-profit governmental projects, factors like inflation, increase of workers' remuneration, and price of materials and raw materials, for completion of the project, result in losing economic justification of the plan or at least, its economical output was less than the specified amount. On time completion of the projects is one of the indexes in management and project efficiency. The projects are facing with uncertain and unpredicted factors that may result in delay for completion of the project. The present study tries to identify risks for completion of a project and introduce their origin by evaluating the risks. Generally, origin of the risks includes teams involved in the project, available resources, environmental conditions, interference of third parties and contractual relationships.

Objectives of the Study

The main objectives of this study are as follows:

1- Identifying delay risks for construction projects in Iran from the view point of owner, contractor and consultant;
2- Evaluating delay risks for construction projects in Iran for prioritization;
3- Classifying risks as strategic, systematic and managerial to identify responsive parts;

Literature Review

Till now, different articles are provided in national and international levels about reasons of delay in major construction projects. According to Assaf et al., 56 reasons are identified for delay in large construction projects. Al Ghafly discussed about delay in water and waste water projects and identified and classified 60 reasons for this (Assaf SA A.-K. M.-H., 1995) (Assaf SA, Al-Hejji S, 2006). Al Ghafy stated in his article that: continues delays in large and medium scale projects are very hard and irreparable in small projects. There are lots of reasons for delay in projects that are resulted from role of the owner, operation of the contractor or consultant, directly, in the planning phase. The main reasons are financial problems, continues changes in the project field and primary planning, delay in decision making and confirmation of the project per phase by the owner, problem in obtaining permit and related problems to relationships and coordination during the project (Al-Ghafly, 1995). Chan and Kumaraswamy performed a research at Hong Kong to evaluate role of 83 delay reasons for the construction projects; they identified 5 main factors, as follows: risk management and weak supervision over the projects, site unpredictable conditions, slow decision making process by the managers, deviation in desires of the customers and deviation in work progress (Chan DW, 1997).

Kaming et al. studied effects of the factors in 31 construction projects of skyscrapers at Indonesia and concluded that cost risks that result in higher costs than the specified amounts, are more frequent and harder than time risks that cause increase of the planned time for the projects. They stated that the main factors that have effects on extra costs are raw materials costs in the projects, increase in inflation rate cost, and inappropriate estimation of the required raw materials and complexity of the construction project. While, the most important factors in time risks are change in plans, weak productivity of the workers, inadequate planning and shortage of resources (Kaming P, 1997). As per the research done by Enshassi et al. 2009, delays are the most important factors that influence on the project operation. In practice, total time of the project completion may be possibly more than the estimated time, as a result of the problems between owner, contractor, sub-contractors and consultants or technical, legal or natural problems (Enshassi, 2010).

As a common problem in the construction projects, exceeded time and time overrun risks are observed in most of the developed and developing countries (Sullivan & Harris, 1986). In Turkey, time risks are observed in global industries projects that the construction projects are parts of these projects (Arditii, 1985). A similar study has been done in Turkey in 2012 by Aynur Kazaz and his colleges, as a result, 49 time risks were identified in the construction projects and the first 5 most important reason were respectively as follow; Design and material changes, delay of payment, cash flow diagram, contractor's financial problems and finally poor labor productivity (Aynur Kazaz, 2012). Mobarak, 2004, discussed role of consultation in minimizing delays of large projects and classified possible delay factors in projects, such as domestic, foreign, financial and non-financial factors. Delay in the construction projects in Egypt is studied by Amer 1994; the aim of his study was to find a solution for completion of the projects without time delay. Result of this study indicated that the main factors of delay time in the construction projects of Egypt are: weak contract management, unreal schedule, and lack of employer's settlement plan in the project phases, as per the contract, and engineering planning expressions during project progress.

Then, another research was done by M.E Abd El-razak et al. in 2008, in Egypt that as a result the most important cause identified as follow: financing by contractor during construction, delays in contractor's payment by owner, design changes by owner or his agent during construction, partial payments during construction and No utilization of professional construction/contractual management (El-Razek, Bassioni, & Mobarak, 2008). Few studies have been conducted in Iran as well as the Middle East region on the subject of construction delays. Such studies are found in different countries like Saudi Arabia (Al-Khalil M, 1999), Lebanon (Mezher T, 1998), and Kuwait (Koushki PA, 2005). Table 1 depicts a summary of previous studies on construction delays in the region of Middle East.

Table 1- Summary of previous studies of the causes of delay in construction projects (Middle East region) (G. Sweis, 2008)

Country	Researchers	Major causes of delay
Saudi Arabia	Assaf et al.	• Slow preparation and approval of shop drawings • Delays in payments to contractors • Changes in design/design error • Shortages of labor supply • Poor workmanship
Lebanon	Mezher et al.	• Owner had more concerns with regard to financial issues • Contractors regarded contractual relationships the most important • Consultants considered project management issues to be the most important causes of delay
Saudi Arabia	Al-Khal and Al-Ghafly	• Cash flow problems/financial difficulties • Difficulties in obtaining permits • "Lowest bid wins" system
Jordan	Al-Moumani	• Poor design • Changes in orders/design • Weather • Unforeseen site conditions • Late deliveries
Kuwait	Koushki et al	• Changing orders • Owners' financial constraints • Owners' lack of experience in the construction business
United Arab Emirates (UAE)	Faridi and El-Sayegh	• Slow preparation and approval of drawings • Inadequate early planning of the project • Slowness of owner's decision making • Shortage of manpower

		• Poor site management and supervision • Low productivity of manpower
Saudi Arabia	Assaf and Al-Hejji	• Change in orders by the owner during construction • Delay in progress payment • Ineffective planning and scheduling • Shortage of labor • Difficulties in financing on the part of the contractor

Research Methodology

First, studying similar researches in the Middle East countries such as United Arab Emirates, Saudi Arabia, Turkey, Jordan and some other developing countries like Malaysia, Nigeria and Libya, effective factors in time risk of the construction projects are identified and classified. Then, 23 factors that have potentiality of occurrence at Iran, were selected and distributed as a questionnaire between three groups of public owner companies (10 companies), consultant engineers companies (15 companies) and contractual companies in private sector (10 companies). In the questionnaire, the experts shall score probability of occurrence of the risks and its Severity as well (Assaf SA, Al-Hejji S, 2006). Finally, considering projects time overrun risks and their priority of delay factors are obtained. In the next step, agreement of three participants was evaluated by Spearman coefficient and finally, the last step is providing suggestions for improve and decrease of delay risks in the construction projects.

Questionnaire Design

Data were gathered by providing a questionnaire to the experts. The questionnaires were classified to two main parts. The first part is general information of the company and expert. All the experts are wanted to state the highest effect of delay in the construction projects and declare estimation percentage of delay factors. The second part of the questionnaire includes a list of previous identified factors that the respondents shall score the problems and possibility of occurrence of the factors from 1 through 5. In fact, two questions are asked for each factor: first- In your opinion, how much is the frequency of this factor in the project progression? Second- If this factor was occurred in the project progression, what will be its implications for the entire project? And/or in other words, how long the delay time will be? Frequency of occurrence is classified in 5 general parts, as very rarely, rarely, sometimes, often and always, which is from 1 through 5, respectively. Difficulty of occurrence is also classified in 5 general parts, as very small, small, medium, high and extreme.

Data Analysis Method

The gathered data are studied based on the following statistical analysis techniques.

Frequency index: A formula is used to rank causes of delay based on frequency of occurrence as identified by the participants.

$$\text{Frequency Index} = (F.I)(\%) = \sum a(n/N)*100/5 \quad (1)$$

Where a is the constant expressing weighting given to each response (ranges from 1 for rarely up to 5 for always), n is the frequency of the responses, and N is total number of responses.

Severity index: A formula is used to rank causes of delay based on severity as indicated by the participants.

$$\text{Severity Index} = (S.I)(\%) = \sum a(n/N)*100/5 \quad (2)$$

Where a is the constant expressing weighting given to each response (ranges from I for little up to 5 for very severe), n is the frequency of the responses, and N is total number of responses.

Importance index: The importance index of each cause is calculated as a function of both frequency and severity indices, as follows:

$$\text{Importance Index} = (I.M.P.I)(\%) = [(F.I)(\%)*(S.I)(\%)]/100 \quad (3)$$

Spearman's rank correlation

Spearman's rank correlation is a non-parametric test. Non-parametric tests are also referred to as distribution free tests. These tests have the obvious advantage of not requiring the assumption of normality or the assumption of

homogeneity of variance. They compare medians rather than means and, as a result, if the data have one or two outliers, their influence is negated. In this research the Spearman's Correlation is used. Correlation is a relationship measure among different parties or factors and the strength and direction of the relationship. In this research it is used to show the degree of agreement between the different parties. The correlation coefficient varies between +1 and _1, where +1 implies a perfect positive relationship (agreement), while _1 results from a perfect negative relationship (disagreement). It might be said then that sample estimates of correlation close to unity in magnitude imply good correlation, while values near zero indicate little or no correlation. The Spearman's rank correlation coefficient r is used to measure and compare the association between the rankings of two parties for a single cause of delay, while ignoring the ranking of the third party. And it is calculated by the following formula:

$$R_s = 1-[(6\sum d^2)/ (n^3-n)] \quad (4)$$

Where r is the Spearman rank correlation coefficient between two parties, d is the difference between ranks assigned to variables for each cause, and n is the number of pairs of rank.

Research Findings and Results

General characteristics of respondents included 10 contractors, 15 consultants and 10 owners out of 23 distributed questionnaires. The contractors surveyed are categorized as grade 2 or above. They have an average of experience of about 23 years, while, participated consultants have an average of about 21 years of experience. Simple random sampling was used to select the participants from an available list. About 76% of the participating contractors specified indicated that the average time overrun for the projects they have experienced is between 20% and 40% of the original project duration. About 56% of the participated consultants specified the same percentage. About 25% of the consultants indicated 40–60% time overrun compared to the original specified duration. 10% consultants and 15% contractors indicated time delay of greater than 100% of the original contract duration. This study covers both private and public projects and has been chosen to be just or almost completed. Owners who have experience with more than one project are surveyed. The participated owners included government departments.

Ranking of delay causes

The three ranking indices explained earlier were used to rank delay causes from viewpoints of the three parties (owners, contractors and consultants). Table 2 shows a list of causes of delay.

Frequency of delay causes

The most frequent causes of delay according to owners, consultants and contractors are shown in Table 3. From owner's point of view, the most frequent causes of delay are related to "Insufficient data collection and survey before design". Inputs of the contractors indicate that the most frequent causes of delay are related to "Late in revising and approving design documents by owner". Consultants, assign "Delay in progress payments by owner" as the most frequent factor of delay.

Severity of delay causes

The most severe causes of delay, indicated by all parties separately, will be highlighted. Owners point out most of the severe causes of delay to "Insufficient data collection and survey before design". Contractors believe that the most severe delay factor is "Rework due to errors during construction" and finally consultants respondent highlighted "More than expected increase in inflammation rate" as most severe delay factor.

Table 2- Delay factors

No	Delay factors
1	Delay in obtaining permits from municipality
2	Late in revising and approving design documents by owner
3	Poor communication and coordination by owner and other parties
4	Legal disputes b/w various parts
5	Conflicts between joint-ownership of the project
6	Change orders by owner during construction
7	Slowness in decision making process by owner
8	Suspension of work by owner
9	Delay in deliverables from consultant to the owner
10	Inadequate experience of consultant
11	Unclear and inadequate details in drawings
12	Insufficient data collection and survey before design
13	Slowness in decision making process by owner
14	Original contract duration is too short
15	Difficulties in financing project by contractor
16	Rework due to errors during construction
17	Delay in progress payments by owner
18	Conflicts in sub-contractors schedule in execution of project
19	Improper construction methods implemented by contractor
20	Poor site management and supervision by contractor
21	Poor qualification of the contractors technical staff
22	Low productivity level of labors
23	Changes in material types and specifications during construction
24	Shortage of construction materials in market
25	More than expected increase in inflammation rate
26	ineffective project management structure (Matrix, Functional, Projective)

Table 3 - Priority of delay causes

POINT OF VIEW	DELAY FACTOR	CAUSE OF DELAY
OWNER	Insufficient data collection and survey before design	Design
	Improper construction methods implemented by contractor	Contractor
	Difficulties in financing project by contractor	Owner
	Delay in progress payments by owner	Owner
	Change orders by owner during construction	Contractor
CONTRACTOR	Rework due to errors during construction	Design
	Insufficient data collection and survey before design	Design
	Late in revising and approving design documents by owner	Owner
	Original contract duration is too short	Project
	Legal disputes b/w various parts	Project
CONSULTANT	More than expected increase in inflammation rate	External
	Delay in progress payments by owner	Owner
	Delay in obtaining permits from municipality	External
	Suspension of work by owner	Owner
	Poor communication and coordination by owner and other parties	Owner

RANKING OF DELAY CAUSES

The data was analyzed by using the importance index formula. The ranking of factors for each answer of questions (for each party) were defined in table 3, 4 and 5.

Table 3- Ranking of sources (groups) of delay by owner

Delay factor	Frequency rank	Frequency index	Severity rank	Severity index	Importance rank	Importance index
Insufficient data collection and survey before design	1	86.00	1	92.00	1	79.12
Improper construction methods implemented by contractor	3	74.00	2	88.00	2	65.12
Difficulties in financing project by contractor	2	76.00	4	82.00	3	62.32
Delay in progress payments by owner	2	76.00	4	82.00	3	62.32
Change orders by owner during construction	3	74.00	3	84.00	4	62.16
ineffective project management structure	5	70.00	2	88.00	5	61.60

Table 4- Ranking of sources (groups) of delay by Contractor

Delay factors	Frequency rank	Frequency index	Severity rank	Severity index	Importance rank	Importance index
Rework due to errors during construction	3	82.00	2	92.00	1	75.44
Insufficient data collection and survey before design	3	82.00	5	86.00	2	70.52
Late in revising and approving design documents by owner	1	88.00	8	78.00	3	68.64
Original contract duration is too short	5	76.00	3	90.00	4	68.40
Legal disputes b/w various parts	5	76.00	3	90.00	4	68.40
Shortage of construction materials in market	4	78.00	6	84.00	5	65.52

As it shows in table 4, from Owner point of view The first factor that cause delay in building construction project is *"Insufficient data collection and survey before design "*.while **"** *improper construction methods implemented by contractor"* and *" difficulties in financing projects by contractor"* comes in second and third position. While the most frequent and most sever factor is also *"insufficient data collection and survey before design".*it can conclude that the design section is the most responsible for delay in projects from owner point of view. The analysis of contractor data identifies *"rework due to errors during construction"* as the first factor for delay in projects. While *"insufficient data collection and survey before design"* and **"***Late in revising and approving design documents by owner"* comes at second and third position. The most frequent factor, in contractor point of view, is *"Late in revising and approving design documents by owner"*, whereas the most sever factor is *"More than expected increase in inflammation rate".* Contractor believed that the most responsible section in delay is design.

Table 5- Ranking of sources (groups) of delay by Consultant

Delay factors	Frequency rank	Frequency index	Severity rank	Severity index	Importance rank	Importance index
More than expected increase in inflammation rate	2	84.00	1	96.00	1	80.64
Delay in progress payments by owner	1	85.33	2	90.67	2	77.37
Delay in obtaining permits from municipality	3	76.00	5	82.67	3	62.83
Suspension of work by owner	6	69.33	3	88.00	4	61. 01
Poor communication and coordination by owner and other parties	3	76.00	7	78.67	5	59.79

Consultant data analysis mentioned *"More than expected increase in inflammation rate"* as the most important factor which cause delay in projects and identify *"Delay in progress payments by Owner"* and *"delay in obtaining permits from municipality"* as the second and third factors. The most frequent factor in this table is *"delay in progress payments by owner"* and the most sever factor is *"More than expected increase in inflammation rate".*in consultant point of view the first responsible part in delay is external causes. As mentioned before, Spearman correlation shows the relation between parties under the survey. With this correlation we can conclude their answers are related to each other or not. When it is 1 means they have positive relation to each other and they have same opinion about one issue. While 0 or any number close to zero means their answer doesn't have any relation to each other and when it is negative numbers means negative related in their answers means completely different opinion about one issue. In table 9 the relations are all negative that result in negative related between Owner, Contractor and Consultant of a project.

Table 6- Spearman rank correlation coefficient

Parties	Spearman Rank correlation Coefficient	Significance Level
owner and contractor	-0.023589744	**0.95**
owner and consultant	-0.020854701	**0.95**
contractor and consultant	-0.103589744	**0.95**

Conclusion

The delay in construction projects in Iran is discussed in a field survey. It studied frequency, severity and importance of the causes of delay. The importance index of each cause is calculated as a product of both frequency and severity indices of each cause. 26 causes of delay were identified through local and international research. The identified causes are combined into 3 problem levels. The field survey included 15 consultants, 10 contractors and 10 owners. Data collected were analyzed by frequency, severity and importance About 76% of the participating contractors specified indicated that the average time overrun for the projects they have experienced is between 20% and 40% of the original project duration. About 56% of the participated consultants specified the same percentage. About 25% of the consultants indicated 40–60% time overrun compared to the original specified duration. 10% consultants and 15% contractors indicated time delay of greater than 100% of the original contract duration. There is

no cause of delay which is common between all parties, but the factor of ***''Insufficient data collection and survey before design''*** is common between owner and contractors parties and the factor of "Delay in progress payments by owner" is common between owner and consultant parties in their first five priorities.

Recommendations:

In this section all delay factors have been divided into 3 main categories in order to find those factors which directly are under project management responsibility and consequently recommend managerial solution to remove this sort of factors. For this purpose 3 level of problems has been identified and defined as follow: Strategic problems, Systematic problems and Managerial problems.

Strategic problems: strategic issues are essential plan questions or crucial difficulties that affect:

- ✓ An organization's mandates mission and values
- ✓ Product or service level and mix
- ✓ Clients, users, or payers, or
- ✓ Cost, financing, organization or management.

This is directly under government responsibility. These problems are long-time ones which need 20 years and above time to solve them. This means they are more complex. For example "More than expected increase in inflammation rate "is a strategic problem that exists in Iran. *Systematic problems:* A systematic issue is a problem due to problems natural in the overall program, rather than due to a particular, individual, separated aspect. A change to the framework, company or guidelines in that program could relieve the systematic problems. This is related to both system owner and government as well. To solve this category of problems we need 5-20 years. For example" Delay in obtaining permits from municipality "is a systematic problem that exists in Iran. *Managerial problems:* These problems come because of lack of interpersonal skills and managerial skills. This is related to both parties of owner and contractors. In other word this problems are due to managers of a project which are owner and contractor and as results show they are more existed in all countries especially in more developed countries which doesn't have any governmental problems. As an example "Poor site management" is managerial problem that is under contractor responsibility. Counties with problems in top part of this pyramid are less developed and the ones with managerial problems that come in above part of the pyramid are more developed countries.

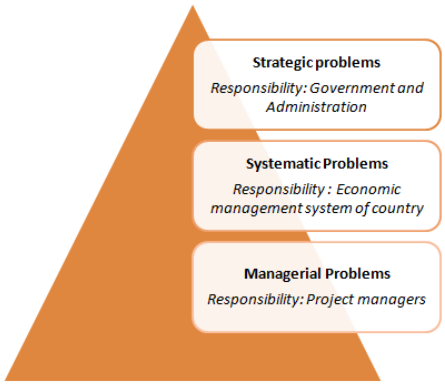

Figure 1- Level of problems pyramids

Table 7- Level of problems from all parties view

background	Delay factor	LEVEL OF PROBLEM
OWNER	Insufficient data collection and survey before design	systematic
	Improper construction methods implemented by contractor	managerial
	Difficulties in financing project by contractor	Systematic
	Delay in progress payments by owner	managerial
	Change orders by owner during construction	managerial
CONSULTANT	More than expected increase in inflammation rate	strategic
	Delay in progress payments by owner	Managerial
	Delay in obtaining permits from municipality	systematic
	Suspension of work by owner	Managerial
	Poor communication and coordination by owner and other parties	managerial

CONTRACTOR	Rework due to errors during construction	managerial
	Insufficient data collection and survey before design	systematic
	Late in revising and approving design documents by owner	Systematic
	Original contract duration is too short	managerial
	Legal disputes b/w various parts	systematic

Delay factors are divided into 3 categories as shown in table 7.The Ratio and percentage of each category calculated in table 8.

Table 8-The Ratio and percentage of each problem level in Iran

LEVEL OF PROBLEM	RATIO	PERCENTAGE
Managerial	7/13	53%
Systematic	5/13	58%
Strategic	1/13	7%

After identification and classification delay factors in construction project PMBOK (Project Management Body of knowledge) as Guideline can be used for solving managerial level's of problem some tools and techniques from this guideline is listed in table 9.

Table 9- Recommendations for managerial level's of problem

MANAGERIAL PROBLEM	PROCCESS GROUP	PMBOK AREA	SOLUTION
Improper construction methods implemented by contractor	executing	Project Quality management	Plan quality management - perform quality assurance - control quality
Delay in progress payments by owner	Monitoring and control	Project cost management	Estimate cost - Determine Budget - Control cost
Change orders by owner during construction	executing	Project scope management	Plan Scope Management-Collect Requirements-Define Scope-Create WBS-Validate Scope-Control Scope
Suspension of work by owner	executing	Stakeholder management	Identify stakeholders - manage stakeholders engagement - control stakeholders engagement
Poor communication and coordination by owner and other parties	Project life cycle	Project communication management	Plan Communications Management-Manage Communications- Control Communications
Rework due to errors during construction	Executing and controlling	Project Quality management	Plan quality management - perform quality assurance - control quality
Original contract duration is too short	planning	Project time management	Engagement Plan Schedule Management- Define Activities Sequence Activities-Estimate Activity Resources-Estimate Activity Durations-Develop Schedule Control Schedule

References

Al-Ghafly. (1995). Delays in the construction of public utility projects in Saudi Arabia. *Master thesis, CEM Dept, KFUPM, Dhahran, Saudi Arabia* .

Al-Khalil M, A.-G. M. (1999). Important causes of delay in public utility projects in Saudi Arabia. *construct management economics* , 647-55.

Arditii, u. A. (1985). Reasons for delays construction. *management and economics* , 171-181.

Assaf SA, A.-K. M.-H. (1995). Causes of delays in large building construction projects. *ASCE journal management engineering* , 45-50.

Assaf SA, Al-Hejji S. (2006). Causes of delay in large construction projects. *Int J Project Manage* , 349–57.

Aynur Kazaz, S. U. (2012). CAUSES OF DELAYS IN CONSTRUCTION PROJECTS IN TURKEY. *JOURNAL OF CIVIL ENGINEERING AND MANAGEMENT* , Volume 18(3): 426-435.

Barajas, A. (2011). *MENAP Oil Exporters: Benefiting from High Oil Prices amid Growing Risks.* International Monetary Fund report.

Chan DW, K. M. (1997). comparative study of causes of time overruns in Hong Kong construction projects. *Int J Project management* , 55-63.

Economist. (Jan 16th 2003). A survey of Iran: Stunted and distorted. *The Economist Journal* , http://www.economist.com/node/1522098.

El-Razek, M. E., Bassioni, H. A., & Mobarak, a. A. (2008). Causes of Delay in Building Construction projects in Egypt. *Journal of construction engineering and management* , 831-841.

Enshassi, A. ,.-R. (2010). causes of variation orders in construction projects in the Gaza strip. *Journal of Civil Engineering and management* , 540-551.

G. Sweis, R. S. (2008). Delays in construction projects: The case of Jordan. *International journal of project management* , 665-74.

Gheissari, A. (2009). *Contemporary Iran: Economy, Society, Politics.* USA: Oxford University Press.

Globalsecurity. (2011, February 6). *Bonyad-e Mostazafan va Janbazan Oppressed and Disabled Veterans Foundation (MJF)*. Retrieved from Globalsecurity: www.Globalsecurity.org

Kaming P, O. P. (1997). Factors influencing construction time and cost overruns on high-rise projects in Indonezia. *Construct Manage Econom* , 83-94.

Koushki PA, A.-R. K. (2005). Delays and cost increases in construction of private residential projects in Kuwait. *construct manage economics* , 285-94.

Mezher T, T. W. (1998). Causes of delays in the construction industry in Lebanon. *Eng Constr Arch Manage J* , 252-60.

Minsky, H. P. (2008). *John Maynard Keynes.* McGraw-Hil.

Press TV, 2. (January 28, 2010). *Iran privatizes $63bn of state assets.* Tehran, Iran: PressTV.

Statistical Center of Iran website. (2012). Retrieved from http://www.amar.org.ir/Default.aspx?tabid=133

Sullivan, A., & Harris, F. (1986). Delay on large construction projects. *International journal of operation and production management* , 25-33.