iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** VII **Month of publication:** July 2017

DOI:

www.ijraset.com

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue VII, July 2017- Available at www.ijraset.com

Identification and Evaluation of Factors Effecting on Delay in Water and Sewage Project in Tehran Province

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Abstract : The proper method of storing and exploitation of water resources as well as water supply to metropolitan subscribers such as Tehran due to the extent of its area, high elevation changes, placing in a warm and dry area, as well as abnormal daily extension require an accurate study and developing a design a comprehensive the project for the present and future. Implementing these projects is important in the form of development projects that must be completed within a limited time. Therefore, this research has been done to improve the water and wastewater development projects in the province of Tehran. The most important factor due to the lack of proper recording of the data and related characteristics is the identification of key and effective indicators in this delay, which was carried out using experiments of experts and papers and field research. Then, through the questionnaire and the choice of the Likert spectrum, the indicators that had the greatest impact on the delay of these projects were identified and the more effective factor was determined using the hierarchical analysis method. Reliability of the data obtained through the secondary questionnaire was confirmed by Cronbach's alpha method. The results obtained from the experts' opinions and comments, using the AHP method and using Expert Choice software, showed that the most important factor is "Lack of credit and non-payment of the status of contractors" that based on similar experiences; the procedures have been suggested to improve it.

Keywords: Water and Wastewater, Tehran Province, Delay of Development Projects, Ratings, Effective Indicators

I. INTRODUCTION

The passing time and technological changes and the changing of environmental and social conditions may make it unjustifiable the projects that at one time have been technical and economical justified in new circumstances. On the other hand, the lack of scientific power utilization and sufficient experience in the early stages of study and design also imposes heavy costs on projects at result make serious problems for completion of projects. It is not unclear that in spite of the great efforts to successfully carry out projects, projects are still delayed and costs go beyond what is anticipated. All managers tend to accelerate or reduce project deviations, but nevertheless, and despite the detailed planning at the beginning of the projects, the average time and cost deviation in the development projects of the country is usually much higher than predictions. According to the monitoring report of the 2013 construction projects, the rate of physical progress of the nationally-designed development projects indicates that 14.9 percent of the projects with 13 percent financial load have grown according to the schedule set.7.2 percent of projects with 7.5 percent financial weight, on average, 15.5 percent are in advance of the time scheduled in the agreement and the remaining projects which are 78 percent in terms of number and in finance terms have 79.5 percent weight, 21.3 percent on average, they were 21.3 percent behind schedule (Office of Monitoring and Evaluation of Plans, 2014).Among the most important infrastructure and job creation projects in Iran are the water projects that, considering the severe shortage of water resources worldwide and the resulting global crisis they have a special position today. Now, due to this situation and huge investments in this sector, especially after the victory of the Islamic Revolution, the delay in implementation and utilization of projects every day imposes a lot of losses on the country and this requires that, with a proper and practical look, firstly, examine the challenges faced by these projects, and secondly, to address them with dynamic and wise management (Hajivand, 2010)

Vatankhah (2003) with a case study of three development projects reported that lack of adequate workforce, inadequate information system, structural weakness, planning and budgeting, and lack of precise design and evaluation of projects were considered to be the most important delay factor. Although he considered the lack of adequate budget allocation as the main reason for the increase in the duration of the project, this factor is influenced by the mismanagement and structural problems of the technical and executive systems of the country.Gandomi (2008), using a case study and field study also investigated and prioritized 47 delay factors in a

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similar study. He considered the cause of the lack of credit, land ownership problems, and delays in contractors' payments as the most important factors for delaying development projects.

Zolfaghari and Hemmati (2011), with the topic of identifying the important factors affecting the delay in the implementation of construction projects in Semnan Province, by studying and surveying experts, managers and contractors involved in the implementation of development projects and analysis of responses have tried to identify the important and effective factors in delaying the implementation of construction projects; to use its results in planning and budgeting of projects and executive agencies. The findings of this research indicate that the weakness of the executive system and country planning, the manner and amount of credit allocation, the weakness of the executive body in the planning, implementation and control of construction projects, the education and specialty of the executive director and the lack of contractors and experienced manpower have been mentioned as important factors in delay of the implementation of civil and government projects in Semnan province.

Undoubtedly, the preparation and updating of executive and financial schedules is one of the important pillars of construction management, because in the event of a timely completion of the project, both the employer and the contractor will enjoy a lot of material and spiritual benefits. Therefore, in industrialized countries, timely delivery is one of the daily concerns of project managers. Unfortunately, in our country, although in recent years, the schedule has been somewhat considered in some treaties, efforts made in this area often do not yield the desired results for various reasons, and after some time, the executive schedules would abandon and practically forgotten. On the other hand, the financial planning for most of our contractors is an unfamiliar issue. While finance constitutes the foundation of the construction industry therefore it is desirable to pay attention to this issue as soon as possible being provided to the contractors' agenda in order to benefit from it. Unfortunately, scheduled programs in our country's industries do not have a solid cultural background and, as a result, they are taken less seriously.

A. Ahmadpour (2006) Categorized the Failure of Scheduling Programs in one of the Following Categories

1) Employer’s deficiencies in the field of management
2) Lack of project financing and lack of proper price estimation
3) Referring tasks to the minimum project price
4) Failure to reconsider the classification of contractors who do not comply with their obligations under the treaty.
5) Failure to use the correct way to prepare and update the timetable for executive and financial\
6) The lack of consideration of the employer and the contractors to the time consumed costs
7) Lack of attention to the uncertainties in providing financial, human, technological and economic resources

Black et al. (2015), in studying the causes of delays in the implementation of the development guidelines of the School of Public Health and the Information Center found that the delay of these projects was 41 months and 34 months, respectively. Also, the results obtained from a survey of 4 groups of employers, consultants, contractors and climatic conditions and other factors showed that the reasons of delay in the employer had the highest share and the causes of delay in the climatic condition of the cluster group and others had the lowest share. Among the causes of the study in the employer group, lack of financial resources had the most effect on delay.

Heidariyeh and Khairandish (2016) studied the causes of delay in the development of wastewater collection projects in the area covered by the District 2 water and wastewater company of Tehran from the perspective of employer, consultant and contractors using the method of analyzing the AHP fuzzy hierarchy. They determined that from the perspective of the employer, the consultant and the contractors, the employer's financial problems had the greatest impact and were ranked first. Contractor's financial problems as well as drilling permissions are in the second and third ranks.

Soybees et al. (2017) identified and categorized the causes of delay in Jordanian construction projects using Derwin system and indicated that contractor financial problems and order changes by the employer are the most important factors leading to delays in the implementation of projects. The bad weather conditions and changes in government laws and regulations have placed in the last ranks of delays ranking.

Kiming et al. (2015) also argue in an analysis of the causes of delays in construction projects in Indonesia that the delay in development projects is not specific to the present or particular country of Indonesia, but also too many other countries are involved with this problem but the factors and effects in different countries vary depending on culture, sources of credit, and the extent of their development.

In this research, using the questionnaire and its distribution among a number of managers and employer forces, consultant and contractor related to construction projects in the water and wastewater Company of Tehran province, the most important factors influencing their delay are evaluated and identified.

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II. RESEARCH METHODOLOGY

By reviewing a number of ongoing or completing large-scale projects that were delayed, they were selected and studied in full. In these plans, cases that were faced with increasing costs were identified and initialized. Reports on increasing the time of these plans have also been studied and the apparent reasons for increasing the time in these plans have been identified. By referring to the managers and experts involved in these plans, a preliminary list (about 60 items) of the reasons for increasing the time and cost in these plans was identified and collected. It was found that some of the reasons are common and can be eliminated, and some of them can be merged into one another. Thus, by the final conclusion, 35 cases were selected as reasons for delayed water and wastewater projects to start the survey. To prioritize the five Likert scale (totally agree to totally disagree) in technical, administrative, social, managerial, and economical spheres are used. At first, the opinions of the factors involved in this stage, including managers and a number of knowledgeable experts and experts involved in such plans, were selected from the subscriber's portfolio, consultant and contractor, and the survey form (questionnaire number one) was sent to them. A total of 40 questionnaires were selected and distributed among the statistical population of various factors (employer, consultant and contractor). After the follow up, approximately 50% of the questionnaires were collected and before the first analysis the adequacy of the samples was tested through the Cochran relationship and the reliability of the extracted data using Cronbach's alpha coefficient. The collected data of each group of factors involved in the projects including the employer, the consultant and the contractor are individually averaged and their average for each cause (cause of delay) is calculated and according to the factors that have the most impact.

III. RESULTS

The initial conclusion showed that technical, managerial, social, and economic and, ultimately, executive factors are the main reasons for delays. The reasons for increasing the time and cost of water and wastewater projects from the point of view of the involving factors are presented as a percentage in Table 1.

Table 1 Summary of the causes of delay in water and wastewater projects from the factors involved perspective (percentage)

Main factors	the comments average as agreement percentage with the effect of the factor			
	In terms of the employer	In terms of the consultant	In terms of the contractor	Mean
Managerial	24.51	25.23	25.16	24.96
Technical	26.78	26.54	26.92	26.74
Executive	10.84	11.47	10.6	10.96
social	22.04	22.52	22.3	22.29
Economic	15.83	14.24	15.02	15.05

Questions that have an average score of less than the average score from the subject's point of view of are removed from the questionnaire and thus, at the end of this stage, 17 questions remain to be used for making the main questionnaire.

Using the obtained factors that had the highest score, questionnaire 2 was set up. According to this questionnaire, using the AHP method, the factors influencing the delays in water and wastewater projects were selected by Expert Choice software in the following order.

A. Lack of credit and non-payment of the contractors condition status
B. Failure financing by the employer
C. The weakness in the contractor's financial power
D. Defects in preliminary studies by the consultan
E. Environmental issues such as sanctions, unknown underground factors, misalignment of inflation and inflation rates..
F. The shortage of experienced human resources in the implementation of the method, which leads to the realization of the timin
G. Problems related to Land ownership
H. Error and defect in design by the consultan
I. Consultant delays in the preparation of maps that are required during the ru
J. Delay in decision making at critical points and by the adviser
K. Failure to pay early payments to contractor
L. Inflatio

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M. Changes in design during execution
N. Structural and Bureaucratic Problems in the Employer's Organizatio
O. Hurry in the opening of projects due to political and social issues and its reverse resul
P. Weather conditions of the project site and incidental event
Q. Failure to choose the type of contract for the assignment of projects

III. CONCLUSION AND RECOMMENDATIONS

As it is known, the three factors that are prioritized are top factors (1) lack of credit and non-payment of contractors' condition; 2) non-financing by the employer; 3) weakness in the contractor's financial ability; all three are about the financial position of the project; and This is a top priority in delaying water and wastewater projects in the province of Tehran. Also, by examining the factors of 4, 8, 9, and 10, it can be seen that the active advisory group was not properly selected or the consultants did not fully understand their duties. Therefore, by reviewing and comparing the results obtained from the existing situation, proposed solutions can be proposed to reduce the delays of water and wastewater projects in Tehran province in the form of 3 titles.

A. Suggestions to the Employer (Tehran Province Water and Wastewater Company)

Due to the high impact of the employer on delayed water and wastewater projects, the following are proposed to reduce the delay time.

1) In order to create funds for payment of state-of-the-art, public-private partnership contracts for water and wastewater projects should be used which, as a result of the diversity of this type of partnership, are listed as examples. Assistance to the country's financial and banking system Publishing the securities Financing Approach
2) Avoid contracting before allocating the total project credit
3) Adopting the order for obtaining the necessary guarantees and obliging the consultants to complete the thorough and accurate technical studies and project design.
4) Change in how to select a consultant: Since the failure of the consultant can delay the project, it is suggested that a strong advisory team monitor the selection of the consultant, and the consultants' bidding along with the design and proposal, and the estimation of the cost and technical justification for improving quality, time and cost take plac
5) Allocating a fine to the employer for delaying payments B- Suggestions for water and water waste projects engineer consultants. Suggestions to consultants as the main design, supervision, and guide for contractors are presented as follows.
6) Using of modern technology and creation of new ideas to reduce costs, time and increase quality
7) Consider the pre-construction problem
8) Proper and optimal design

B. Offers to Contractors in the Water and Wastewater Sector

Suggestions to the contractor as one of the main factors affecting project delays are as follows.

1) Use of Value Engineering Knowledge
2) Use of management and documentation in development project
3) Supply Chain Management
4) Analysis of the project before the bidding

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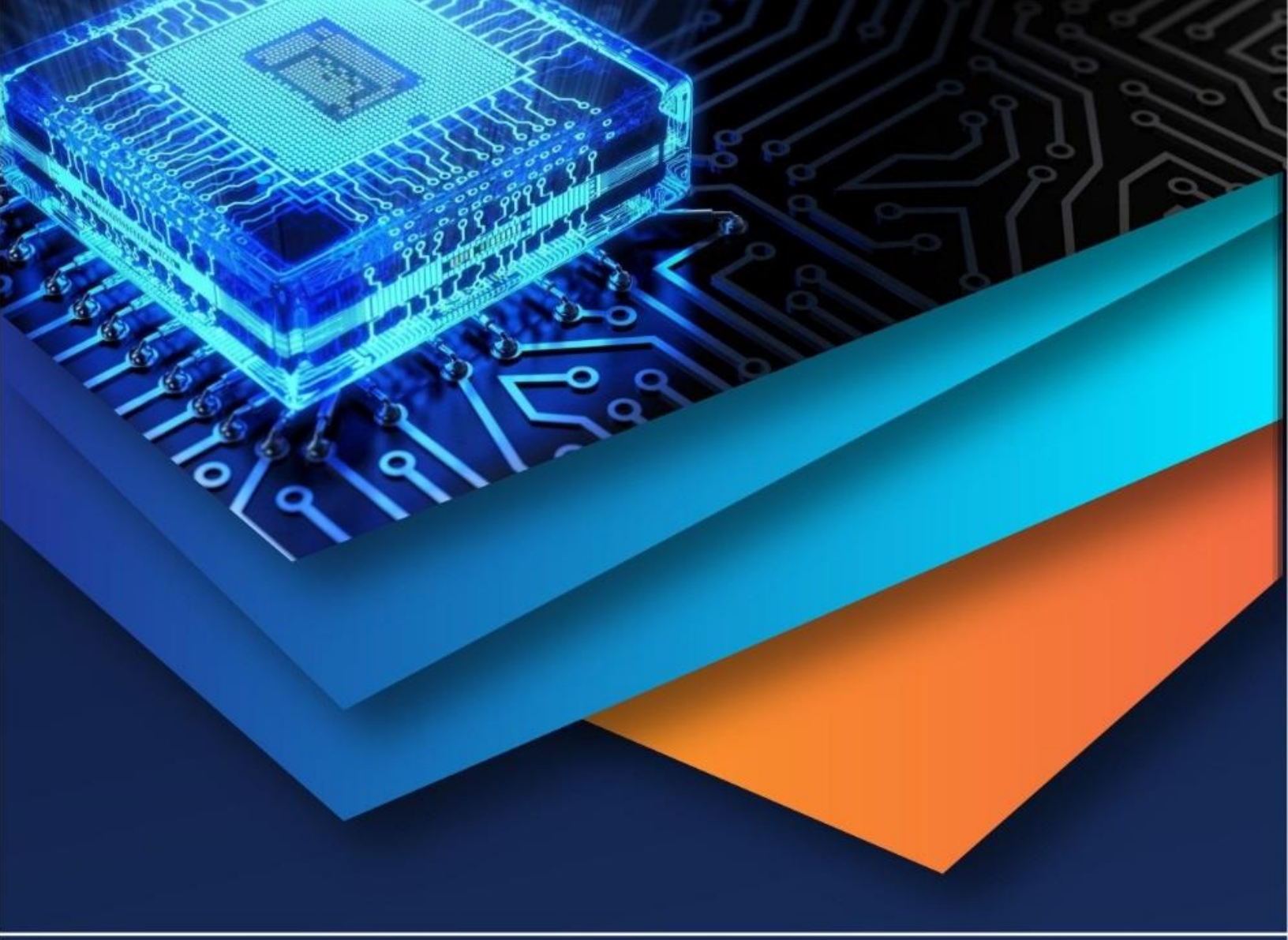

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