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Identification of Effective Technical Factors on Delay; Case Study; Civil Projects of Bushehr Province's Department of Sports and Youth

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ABSTRACT

The present study has reviewed project's delay with an approach to lack of on time payment of demands of the contractors during the enforcement of the project based on technical index in civil projects of the Sports and Youth department of Bushehr province. The main purpose of this research is to review and analyze the effective technical factors on delay and identifying the degree of impact of these factors and prioritizing them. A designed questionnaire was sent to the mentioned office about operational staff of civil projects and it was filled out by this staff. According to 35 valid responses, effective technical factors in delay were identified and prioritized in this study and the results were analyzed by using SPSS and LISREL software. Given the results obtained from analysis of data, sub-index of improper design, which increases the payment in the contract, has had the most impact on delay. Therefore, a proper designed depending on the geographical position of the location shall be done by skilled consulting engineers.

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INTRODUCTION

Generally, one of the basic indexes in evaluation of projects' success is their implementation at the duo time and or an implementation without delay. If exploiting the projects is delayed, in addition to loss of capital, it will also lose its economic and technical justification. In this perspective, development of construction and sports projects of Bushehr province is also crucially important and it is obvious that lack of successful and on time implementation of these projects in terms of time and optimal cost, in addition to negative consequences including: undesirable perspective of the organization, improper quality and so on, will also deprive people's trust of authorities. Technical factors are among the causes that affect delay and they have been identified and prioritized in this research.

Statement Of The Issue:

In construction industry, delay means going further than the time which is determined in the contract or going further than the date that all of units involved in the project agree on. In most cases, delay for the contractor means increasing the cost of the superior and being influenced by the current inflation [7].

Delay in the implementation of civil projects, in addition to loss of national capital, also comes with regional imbalance. In other words, regions in which the status of closed projects is desirable and they have had proper economic efficiency are opposed to regions in which several projects haven't had tangible economic impacts because they haven't been closed yet [1].

Delays are divided into two groups of authorized and unauthorized. These delays in developed countries are mostly of the authorized group which can hardly ever be predicted, but in developing countries they are unauthorized delays [2].

If more than one delay happens over a period in a project, so called simultaneous delay has occurred. Occurrence of simultaneous delays can lead to the complexity of reviews; therefore, their identification and analysis is especially significant [4].

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Problems caused by technical factors are among those problems that lead to the occurrence of delay in civil – sports projects of Bushehr province. In this research, it has been attempted to identify these problems as much as possible and to specify the degree of impact of each of them on delay.

Research Hypothesis:
Hypothesis: technical factors largely affect delay in project's implementation.

Research Methods And Used Statistical Tests:
Since the results of the research can be used, thus the purposes of the research are applicable. Research is done with a case-descriptive method in terms of data gathering. Statistical methods that have been used are Kolmogorov-Smirnov test, t-test with a single sample, structural equation approach, and confirmatory factor analysis and the inputs have been analyzed by using SPSS and LISREL software.

Method And Tools Of Information Gathering:
The method of information gathering includes library method, observation and interview. In this research, the main tools of information gathering are standard questionnaire that have been used. The questionnaire of technical factors of this research includes 12 questions and it has been filled out by 35 of the project's operational staff.

Output Results Of Questionnaire's Questions:
The results obtained from the analysis of questionnaire's information has been shown in the following graph based on the mean of the rate of impact that each item has on delay in implementation of civil and sports projects of Bushehr province.

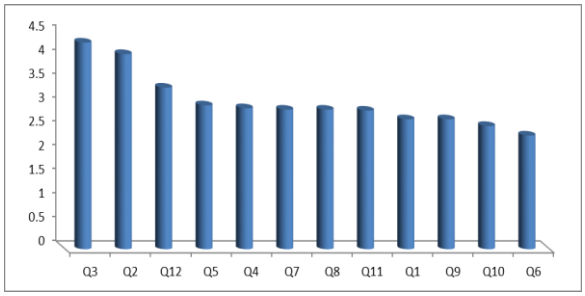

Fig. 1: priority of effective technical factors on delay in implementation of project based on the mean of items.

Graph, from left to right:
1. Improper design that increases the amount of the payment of the contract
2. Incomplete plans
3. Technical weakness of the employer in controlling and reviewing the record
4. Change in the design by the consulter during operation
5. Change in specification and type of materials in construction
6. Weakness in contractor's engineering technical section
7. Insufficient skills and experience of the contractor
8. Delay in preparation and announcement of the plans
9. Selecting improper technology of construction and increasing the costs
10. Not studying accurately the obstacles in the way of project
11. Change in the implementation method during operation
12. Designing error by the designer due to his unfamiliarity with the local and environmental position

By considering the obtained means, it becomes specified that in technical variables, improper design that increases the amount of the payment of the contract has the most effect and designing error by the designer due to his unfamiliarity with the local and environmental position has the least impact on delay in implementation of civil – sports projects of Bushehr province.

Analysis Of The Model And Its Results:
In order to analyze the data of the research, several analyses have been sed. In order to analyze the data, first we review the hypothesis of the data's normality in each group with the help of the Kolmogorov-Smirnov test. Then, in order to test the hypothesis of the research, we use the t-test with a single sample.

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Review of normality status of research's variable:

Table 1: Kolmogorov-Smirnov test, in order to review the normality of the research's variable.

Variable	Volume of the sample	Kolmogorov-Smirnov test	Significance
Technical	35	1.07	0.20

The results of the above table show that the rate of significance of the variable of the research is more than the rate of the considered alpha, thus, it is concluded that technical index follows the normality hypothesis.

Review of the coefficients of factor loadings of the hidden technical variable:

Table no. 4 shows the results of the confirmatory factor analysis of technical questions. As it can been seen, all of the questions have a acceptable factor loading

Table 2: the results of the confirmatory factor analysis of technical questions.

Variable	Questions	Significance level	T value	Standard error	Factor loading
Technical	Q1	P</01	8.33	0.06	0.50
	Q2	P</01	6.31	0.05	0.33
	Q3	P</01	6.48	0.04	0.28
	Q4	P</01	4.56	0.05	0.23
	Q5	P</01	5.97	0.06	0.38
	Q6	P</01	3.91	0.07	0.28
	Q7	P</01	12.50	0.06	0.77
	Q8	P</01	14.48	0.06	0.92
	Q9	P</01	7.71	0.06	0.47
	Q10	P</01	13.87	0.06	0.87
	Q11	P</01	15.15	0.06	0.90
	Q12	P</01	8.73	0.06	0.53

According to table no. 2 which shows the results of the confirmatory factor analysis of technical questions, among the reviewed questions, Q8 with 0.92 factor loading has the most effect and Q4 with 0.23 factor loading has the less effect.

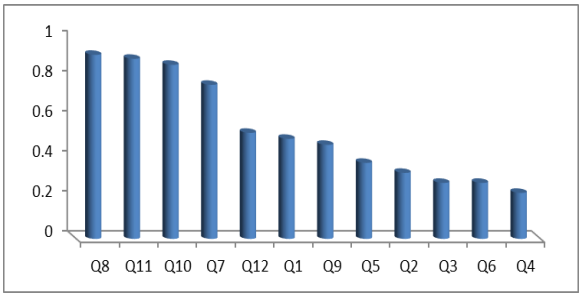

Fig. 2: priority of factor loadings of hidden technical variables.

By considering the reported factor loading, it is specifies that insufficient skill and experience of the contractor has the most effect and change in specifications and type of materials in construction has the least effect on explanation of hidden technical variables.

fitting indexes of confirmatory factor analysis of the technical index:

Table 3: indexes of fitting evaluation of the technical index.

model	Index					
	GFI	AGFI	CFI	RMSEA	Chi-Square/df	X2
Single-factor model of technical index	0.88	0.85	0.94	0.05	2.69	145.26
GFI = goodness of fitting index (> 0.8 to 0.9), AGFI = adjusted goodness of fitting index (> 0.8), CFI = comparative fitting index (> 0.90 to 0.95), RMSEA = root mean square error of approximation (< 0.06 to 0.08), Chi-Square/df = degree of freedom chi-section (> 3), X2 = Chi-Square						

The results of the above table show that all indexes have acceptable and goof fitting. Therefore, we can say that a technical single-factor model has a good factor structure.

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Fitting Of The Research's Model:

In this section, in the respect of reviewing the fitting of the model and prioritizing, the LISREL software has been used. the designed model in the software is like the following graph.

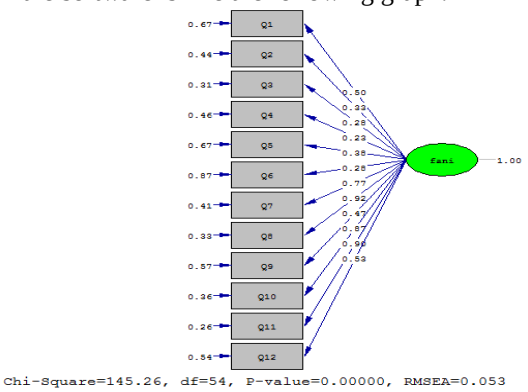

Fig. 3: confirmatory factor analysis of the technical single-factor model.

As it is seen, the hidden technical variable has been observed, explained and measured with 12 variables. The numbers on the arrow specify the rate of factor loading of the items. This graph shows the factor loading of each of the questions of the questionnaire. By factor loading we mean correlation coefficient between the question and the required dimension. The more the factor loading is, the more the rate of connection of that question to the dime associated with it, which is the technical index, will be.

Review Of Research Hypothesis:

The research hypothesis has been expressed as follows:

<<Technical factors largely affect delay in project's implementation.>>

H_0: Technical factors are not that effective on delay in project's implementation

H_1: Technical factors are effective on delay in project's implementation

The single-sampled t-test was used in order to test the research hypothesis. If the rate of obtained significance (*P*) was larger than the required significance level of the research ($\alpha = 0.05$), we conclude the H_0 and if the rate of obtained significance (*P*) was smaller than the required significance level of the research ($\alpha = 0.05$), we conclude the H_1.

Table 4: testing research hypothesis.

Variables title	Mean	Standard deviation	Mean difference	t-test	Freedom degree	Error rate (P)	Stastical conclusion	Research conclusion
Technical factors	3.07	0.55	0.07	0.71	34	0.48	The error rate is more than 0.05.	Hypothesis is rejecrted

The results obtained from the independent t-test for reviewing the opinions of the experts about the impact of effective technical factors on delays is equal to (t=0.71) (P>0.05); therefore, it is concluded that << Technical factors are effective on delay in project's implementation>>.

Discussion and conclusion:

The results obtained from this research confirm this claim that technical factors are effective on delay in implementation of projects to an average extent. It means that since the error rate is more than the significance level considered by the research and the obtained mean is more than the considered means, therefore the second hypothesis is rejected. In other words, << technical factors don't largely affect delay in project's implementation and they are effective to an average extent>>.

Change in the conditions of site and shortage of materials are one of the most important factors that lead to delay of tie and increase costs in the project [5].

Technical inabilities is considered as one of the effective factors on increasing time (delay) and cost [6].

In reviewing the causes of delay of civil projects of the network of country's airport, the defect of designing and lack of familiarity of the designers with operational affairs and also lack of one time providing of sources and facilities that would be in the hands the operation unit, after financial factors, was identified as an effective technical factor [3]. In this research, financial factors were introduced as effective factors on delay and technical factors were introduced in the next rank.

The results of all of the above researches are in compliance with the results of this research.

Recommended Actions:

1. Proper operational methods and usage of new methods
2. Delivering the land immediately after concluding the contract
3. Providing materials, facilities and equipments to which the employer commits.

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