The Effect of Technical Standards on the Performance of Construction Projects in Contracting Agreements of Tehran Municipality District 8

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***Abstract*— The purpose of this study is to investigate the effect of technical standards on the performance of construction projects in municipal contracting agreements of Tehran Municipality District 8.**
The statistical population of the research includes 40 experts, consulting companies, construction projects companies, as well as elites in this field in the municipality of Tehran Municipality District 8. Data collection tool was a researcher-made questionnaire consisting of 34 questions, of which 4 sub-hypotheses and 1 main hypothesis were examined by a questionnaire. The data analysis method is the Structural Equation Method (SEM). The results showed that the standard of managing construction project growth model, the practical project risk management standard and the project management standard have the greatest impact on the success of construction contracting agreements Therefore, the use of high-quality materials, standard concreting and supervising the execution of building demolition operations have the greatest impact on construction projects. The use of high-quality materials, standard concreting and the use of metal structures have the greatest impact on the performance of construction projects. Reinforcement, utilization of principles in excavation and supervision of building demolition operations have the most importance in the performance of construction project contracts.

Keywords*— *Technical Standards, Performance, Construction Projects, Contracting Agreements, Tehran Municipality District 8

Introduction

Standard is a concept that can indicate the performance and discipline in the intellectual, scientific, technical and cultural activities of society and in a general, it is synonymous with order (Rosemary, 2012).
In this regard, the International Organization for Standardization has stated in the definition of standard; A standard is evidence that contains rules, guidelines, or features for an activity, or the results of standard has been provided for general and frequent use, in addition it has been approved by a recognized organization, with the goal of achieving the desired level of discipline and (improvement) in a specific field. (Bakhtiari, 2010)

Today, the construction and operation of various development projects in various fields is the main priority for the growth and construction of the country.
But the excessive length of execution time, the obvious poor quality of the implemented projects, the high cost of the projects compared to the initial estimation, the lack of a strong execution strategy, are considered as part of the chain of important problems of these projects. Meanwhile, the growing trend of investment in large development projects, the necessity to use and improve new methods and structures of project management in order to achieve the goals of socio-economic development program of the country is quite evident. (Daneshi Rad, 2005).
From a technical point of view, there are issues such as the selection of different construction alternatives, the existing climatic conditions, the method of investment, the manner of implementation and maintenance. Economically, the useful life of the building, initial investment costs and other costs such as maintenance, reconstruction and improvement are other factors that affect the choice of system type to design and implement. (Sheikhi, 139)
Technical and executive system, set of principles, methods, regulations and technical guidelines, legal, financial rules governing the preparation, implementation, evaluation and operation of construction projects in the country and how to select and use the factors involved and determine the characteristics of these factors and the relation between them which are widely published and used as regulations, instructions or guidelines. Improving the performance of executive agencies with the approach of improving the quality of implementation, reducing costs and duration of implementation and most importantly the effect of technical standards on project performance are the goals of regulatory agencies. (Farhadi et al., 2017)

Technical standards

technical standard refers to the contract, tradition, or model laws that its implementation has been accepted. (Darvish, 2016)

Performance of construction projects

The construction industry has many problems to provide high quality construction projects, because it involves many professions, jobs and organizations.

Some clients underestimate the effect of factor consulting services on the success of a construction project (Barber et al., 2000).

Many delays, reimbursements, feedback, changes, claims, and disputes can be traced to wrong design, poor contract management, or poor customer representative oversight (Cheney & Valdes, 2003).

In addition, the production processes of construction projects are generally non-standard. Hence, quality assurance is difficult. Therefore, some local building officials are making efforts to reduce the quality by seeking to reduce the ISO 9000 certification for all contractors bidding on public sector projects.

Errors caused by a system can be prevented or minimized by implementing a Quality Management System (QMS) (Latham, 1994). Among the various QMSs, ISO 9000 certification has been accepted by many countries in the construction industry. In Hong Kong, for example, all consultants must have an ISO 9000-based QMS before they can participate in public development projects (Office, 2001). With the release of ISO 9000: 2000, there is an unprecedented emphasis on customer satisfaction and continuous improvement (Murphy, 2002). "Satisfaction" can be measured by comparing the difference between what is expected and what is actually received (Hill et al., 2002); Clients meet the quality performance of a consultant when the quality of provided service exceeds their minimum expectations. Continuous improvement can only be achieved if consultants are aware of their weaknesses or shortcomings and make adjustments to meet their clients' expectations.

Conceptual model of research

The conceptual model of the present article is as follows:

Figure 1: Conceptual model of research

Research Method

The research method is correlational, descriptive and applied. In this research, two methods including library and field method have been used to collect data.

Statistical population and number of samples

the statistical population in the present study is 80 people, experts, consulting companies, construction project companies and also using the opinions of elites in this field in the municipality of District 8 of Tehran.

Cochran's formula was used to determine the sample size. according to this subject, 40 people was obtained in this study.

Structural Equation Modeling (SEM)

In this section, the structural equation model is estimated to investigate the effect of technical standards on the performance of construction projects. For this purpose, at first, a goodness of fit test and confirmatory analysis are presented. The structural equation model is then estimated. It should be noted that this section has been done separately for each hypothesis.

Hypothesis 1: Technical standards affect the success of construction Contracting Agreements

Goodness of fit test

Questions 1 to 10 of the questionnaire are related to the first hypothesis. In this section, there was no need to delete the question in the questionnaire. The indicators of goodness of fit that are examined in this study are: GFI and AGFI indicators. RMSEA index, KS statistics, NFI index and CFI. The value of these indicators is as shown in Table 1.

KS statistics is a solution for testing homogeneity for nominal scale variables with more than two categories.

This test is the first indicator in the structural equation model to measure the suitability of the model. This test shows the similarity of a theoretical model with a real model.

Table 1: Goodness of fit test indicators

Result	Value	Indicator
Confirmed	0.99	GFI
Confirmed	0.96	AGFI
Confirmed	0.06	RMSEA
Confirmed	54.955	KS
Confirmed	0.94	NFI
Confirmed	0.9	CFI

As can be seen, the values of GFI, AGFI, NFI and CFI indices are higher than 0.9. Therefore, these indicators show an acceptable fit of the model. RMSEA values are equal to 0.06, which indicates an acceptable fit of the model. The value of KS is 54.955, which is significant at a level smaller than p <0.1. This statistic indicates that the observed and estimated variance-covariance matrices are different. This statistic is affected by the sample size, and direct interpretation of this statistic is often avoided. The ratio of this statistic to the degree of freedom, which is 35, is less than 3 and it shows the goodness of the model. Therefore, all six mentioned indicators confirmed the fit of the model; Therefore, the structural model of the research is suitable in terms of goodness of fit test indicators.

Confirmatory analysis

The following figure shows the factor loads and variance explained in the questions.

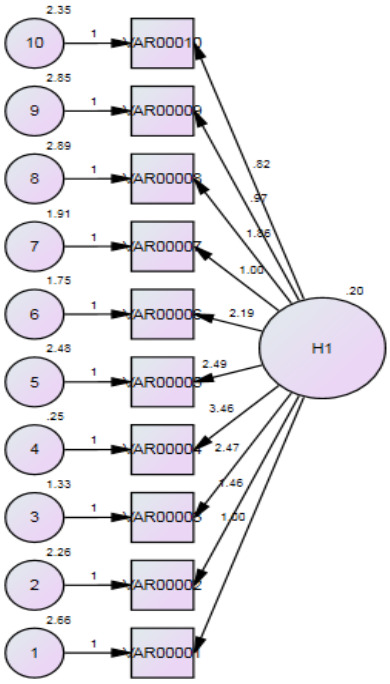

Figure 2: Factor loads and explained variance of the questions for the first hypothesis

As it is known, question 4 has the highest factor load and it is equal to 3.46 on the structure. The following table shows the significance of factor loads and fit indices.

Table 2: Factor loads of the first hypothesis questions

t-statistic	Significance level	Factor load	Question
2.916	0.004	1.00	1
2.304	0.021	1.46	2
3.623	0.0	2.47	3
3.752	0.0	3.46	4
3.147	0.002	2.49	5
3.124	0.002	2.19	6
3.225	0.00	1.00	7
3.241	0.0	1.86	8
3.447	0.0	0.97	9
3.558	0.0	0.82	10

Therefore, all factor loads are significant at the 1% level and their t-statistic is also significant. Because factor loads are high and significant, technical standards affect the success of construction Contracting Agreements

Hypothesis 2: Dimensions and components of technical standards are effective in construction projects.

Goodness of fit test

Questions 11 to 19 of the questionnaire are related to the second hypothesis. In this section, there was no need to delete the question in the questionnaire. The indicators of goodness of fit that are examined in this study are:

GFI and AGFI indicators. RMSEA index, KS statistics, NFI index and CFI. The value of these indicators is as shown in Table 3.

Table 3: Goodness of fit test indicators

Result	Value	Indicator
Confirmed	0.98	GFI
Confirmed	0.95	AGFI
Confirmed	0.06	RMSEA
Confirmed	43.675	KS
Confirmed	0.93	NFI
Confirmed	0.9	CFI

As can be seen, the values of GFI, AGFI, NFI and CFI indices are higher than 0.9. Therefore, these indicators show an acceptable fit of the model. RMSEA values are equal to 0.06, which indicates an acceptable fit of the model. The value of KS is equal to 43.675 which is significant at the level less than p <0.1

This statistic indicates that the observed and estimated variance-covariance matrices are different. This statistic is affected by the sample size, and direct interpretation of this statistic is often avoided.

The ratio of this statistic to the degree of freedom, which is 27, is less than 3 and shows the goodness of the model.

Therefore, all six mentioned indicators confirmed the fit of the model; Therefore, the structural model of the research is suitable in terms of goodness of fit test indicators.

Confirmatory analysis

The following figure shows the factor loads and variance explained in the questions:

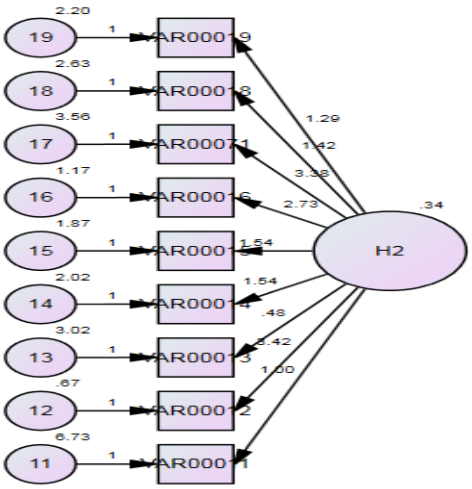

Figure 3: Factor loads and explained variance of the questions for the second hypothesis

Table 4: Factor loads of questions for the second hypothesis

t-statistic	Significance level	Factor load	Question
3.102	0.00	1.00	11
2.653	0.001	3.42	12
3.101	0.00	0.48	13
3.458	0.00	1.54	14
3.159	0.001	1.54	15
3.248	0.00	2.73	16
2.627	0.004	3.38	17
3.012	0.002	1.42	18
3.032	0.001	1.29	19

Therefore, all factor loads are significant at the 1% level and their t-statistic is also significant. Because factor loads are high and significant, the dimensions and components of technical standards affect construction projects.

Hypothesis 3: Indicators of technical standards affect the performance of construction project contracts.

Goodness of fit test

Questions 20 to 26 of the questionnaire are related to the third hypothesis. In this section, there was no need to delete the question in the questionnaire. The indicators of good fit that are examined in this study are: GFI and AGFI indicators. RMSEA index, KS statistics, NFI index and CFI. The value of these indicators is as shown in Table 5.

Table 5: Goodness of fit test indicators

Result	Value	Indicator
Confirmed	0.99	GFI
Confirmed	0.95	AGFI
Confirmed	0.06	RMSEA
Confirmed	22.386	KS
Confirmed	0.94	NFI
Confirmed	0.9	CFI

As can be seen, the values of GFI, AGFI, NFI and CFI indices are higher than 0.9.

Therefore, these indicators show an acceptable fit of the model. RMSEA values are equal to 0.06, which indicates an acceptable fit of the model. The value of KS is equal to 22.386 which is significant at the level less than p <0.1. This statistic indicates that the observed and estimated variance-covariance matrices are different. This statistic is affected by the sample size, and direct interpretation of this statistic is often avoided. The ratio of this statistic to the degree of freedom, which is 14, is less than 3 and shows a good fit of the model. Therefore, all six mentioned indicators confirmed the fit of the model; Therefore, the structural model of the research is suitable in terms of Goodness of fit test indicators.

Confirmatory analysis

The following figure shows the factor loads and variance explained in the questions.

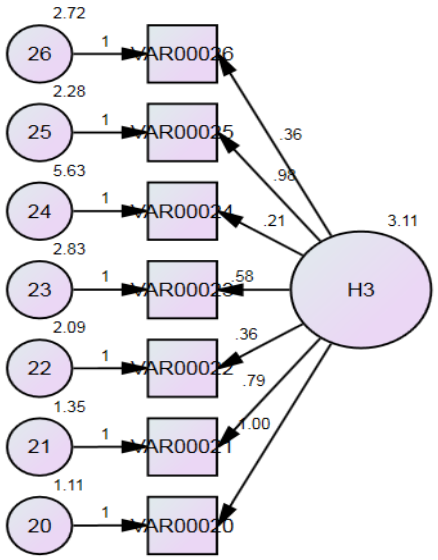

Figure 4: Factor loads and variance explained questions for the third hypothesis

As it is known, question 20 has the highest factor load and equal to 1.00 on its structure. The following table shows the significance of factor loads and Goodness of fit test indicators.

Table 6: Factor loads of the third hypothesis questions

t-statistic	Significance level	Factor load	Question
3.138	0.00	1.00	20
3.968	0.00	0.79	21
3.889	0.00	0.36	22
3.789	0.00	0.58	23
3.996	0.00	0.21	24
3.789	0.00	0.98	25
2.558	0.00	0.36	26

Therefore, all factor loads are significant at the 1% level and their t-statistic is also significant. Because factor loads are high and significant, technical standard indicators are influential in the performance of construction project contracts.

Hypothesis 4: Technical standard indicators are important in the performance of construction project contracts.

Goodness of fit test

Questions 27 to 34 of the questionnaire are related to the fourth hypothesis. In this section, there was no need to delete the question in the questionnaire. Goodness of fit test indicators that are examined in this study are: GFI and AGFI indices. RMSEA index, KS statistics, NFI index and CFI. The value of these indicators is as shown in Table 7.

Table 7: Goodness of fit test indicators

Result	Value	Indicator
Confirmed	0.99	GFI
Confirmed	0.95	AGFI
Confirmed	0.06	RMSEA
Confirmed	36.975	KS
Confirmed	0.94	NFI
Confirmed	0.91	CFI

As can be seen, the values of GFI, AGFI, NFI and CFI indices are higher than 0.9. Therefore, these indicators show an acceptable fit of the model. RMSEA values are equal to 0.06, which indicates an acceptable fit of the model. The value of KS is equal to 36.975, which is significant at a level smaller than p <0.1. This statistic indicates that the observed and estimated variance-covariance matrices are different. This statistic is affected by the sample size, and direct interpretation of this statistic is often avoided. The ratio of this statistic to the degree of freedom, which is 20, is less than 3 and shows a good fit of the model. Therefore, all six mentioned indicators confirmed the fit of the model; Therefore, the structural model of the research is suitable in terms of Goodness of fit test indicators.

Confirmatory analysis

The following figure shows the factor loads and variance explained in the questions.

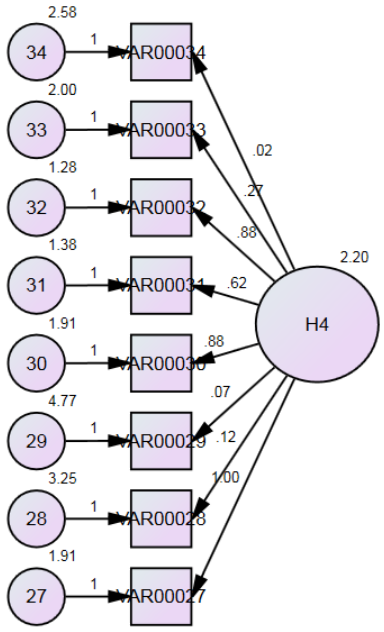

Figure 5: Factor loads and explained variance of the questions for the fourth hypothesis

As it is known, question 27 has the highest factor load and its equal to 1.00 on its structure. The table below shows the significance of factor loads and fit indices.

Table 8: Factor loads of the third hypothesis questions

t-statistic	Significance level	Factor load	Question
3.222	0.00	1.00	27
3.345	0.00	0.12	28
3.654	0.00	0.07	29
3.567	0.00	0.88	30
3.555	0.00	0.62	31
3.543	0.00	0.88	32
2.908	0.00	0.27	33
3.918	0.00	0.02	34

Therefore, all factor loads are significant at the 1% level and their t-statistic is also significant. Because factor loads are relatively high and significant, technical standard indicators are important in the performance of construction project contracts.

Conclusion and Recommendations

The aim of this study was to investigate the effect of technical standards on the performance of construction projects (Case study Contracting Agreements of Tehran Municipality District 8)

The results of the first hypothesis showed that questions 4, 5 and 3 have the highest factor load, respectively. Therefore, the standard of managing construction project growth model, the practical project risk management standard and the project management standard have the greatest effect on the success of construction contracting agreements.

The results of the second hypothesis showed that questions 12, 17 and 16 have the highest factor load, respectively. Therefore, the use of high quality materials, standard concreting and monitoring the execution of building demolition operations in construction projects have the greatest effect.

The results of the third hypothesis showed that questions 20, 25 and 21 have the highest factor load. Therefore, the use of high quality materials, standard concreting and the use of metal structures have the greatest effect on the performance of construction projects.

The results of the fourth hypothesis showed that questions 27, 30 and 32 have the highest factor loading. Therefore, reinforcement, utilization of principles in excavation and monitoring the execution of building demolition operations are of the most importance in the performance of construction project contracts.

According to the results, since the standard of managing construction project growth model, practical project risk management standard and project management standard have the greatest effect on the success of construction contracts, so construction managers should Consider these standards more.

Also, since the use of high quality materials, standard concreting and monitoring the execution of building demolition operations have the greatest effect on construction projects, construction managers are advised to take more measures to provide quality materials and perform cost-benefit analysis in a way that uses more of these materials in construction. Standard concreting and demolition operations should also be considered as they are very important in construction operations.

According to the use of high quality materials, standard concreting and the use of steel structures have the greatest effect on the performance of construction projects, so due to the second hypothesis, it is determined the use of high quality materials and standard concreting are really effective in improving the performance of construction projects.

Since retrofitting, utilization of principles in excavation and monitoring of demolition operations are of paramount importance in the performance of construction project contracts, construction managers are advised pay special attention to retrofitting and

excavation principles in construction. Also, according to the second hypothesis, supervising the implementation of building demolition is so important, hence it is essential to notice them.

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