

Identify and Assess the Factors Affecting the Decline in the Quality of Construction Projects with a Phased Approach and Solution to Improve

Dara Parsa¹, Saber Shiri Pour²

¹Graduate Student in Civil Engineering, Construction Management Orientation, Non-Profit Tabari University of Babol, Mazandaran, Iran,
²Assistant Professor in Industrial Engineering, University of Science and Technology of Mazandaran, Mazandaran, Iran

Abstract

High quality execution of construction projects is one of the major factors influencing the reduction of costs And the execution of construction projects, so identifying factors that affect the quality of construction projects is essential. As well as studies in the field of quality management can greatly reduce costs caused by quality defects, so the aim of this study is to identify and prioritize the factors influencing the decline in the quality of construction projects. 250 engineering community Marivan city (including employers, contractors, consultants, students, etc.) as a prototype study to randomly selected and then respond to the initial questionnaire with 73 items, to determine the factors influencing responded and the second one 12 experts using snowball sampling were identified in 5 companies that have paired comparison questionnaire. 7 factors influencing the exploratory factor analysis using SPSS software was detected and then using confirmatory factor analysis (software Smart PLS) was reduced to 5 of the 27 items. Also to become fuzzy numbers and quality of the classic mode and quantitative (numerical) being used triangular fuzzy numbers. Finally, Chang fuzzy analysis was used to prioritize criteria. The results of exploratory factor analysis, five factors, including those related to the employer, factors related to consultants, agents of the contractor, Factors related to the lack of manpower and machinery and materials as factors influencing the reduction in the quality of construction projects were identified. Confirmatory factor analysis, five factors, according to the goodness of fit of reliability (validity and reliability verification), respectively.

Key words: Construction projects, Quality, Fuzzy hierarchical analysis

INTRODUCTION

Developing countries to achieve growth, are forced to increase investment in infrastructure sectors. In addition to providing the basic needs of these sectors has a positive effect on accelerating economic development. Given the importance of project management, in recent years, various standards have emerged in this field. The standards include basic principles and requirements for the successful management of a project or an organization's project management system implementation seems necessary. The most famous and most widespread standard among

standards for project management, project management body of knowledge[1]. This standard, for guiding successful projects, 9 knowledge areas to be included. Of these areas, project scope management, project time management, project cost management and project quality management as the main areas to be considered. Based on PMBOK standard quality, integrity is the hallmark of a category that is related to its ability to fulfill the needs specified and implied. Project Quality Management includes the processes required to ensure they meet the needs that have been pledged for the project. These processes interact with each other and also processes other areas of knowledge. Should be the main approach of the ISO quality management with the International Organization for Standardization ISO 9000 and 10000 series of standards and guidelines are consistent announced. It should also be dedicated approach to quality management such as those by Deming, Juran, swineherd, as well as the general approaches such as Total Quality Management TQM environment. Project Quality Management must address the management

Access this article online



www.ijss-sn.com

Month of Submission : 05-2017
Month of Peer Review : 06-2017
Month of Acceptance : 07-2017
Month of Publishing : 08-2017

Corresponding Author: Saber Shiri Pour, Assistant Professor in Industrial Engineering, University of Science and Technology of Mazandaran, Mazandaran, Iran.

of project and product management project[2]. Project management team should be aware that modern quality management complements project management because both insist on the following:

Customer satisfaction, understanding, managing, and influencing needs so that customer expectations are fulfilled. This requires a combination of conformance to requirements (the project must produce what is claimed) and fitness for use (the product or service production must satisfy real needs) is.

Prevention prior to inspection: The cost of preventing mistakes is always much less than the cost of correcting them. However there is one major difference that it is necessary to consider carefully the project management team And that is the temporary nature of the project means that investments in improved product quality Especially on error prevention and evaluation must often be tolerated by the Project [3].

Because it may not lead project long enough to see the work efficiency According to assessments, the main reasons for the prolongation projects in Iran include: weakness in early studies, the use of weak administrative organs in tenders on projects due to lower prices And under the influence of technical proposal of the financial offer, the weakness of the perfect site supervision consulting engineer on the project, Low effectiveness of project management in the process control industrial projects, weaknesses in process and bureaucracy cyclical payments for contractor and consultant positions, Lack of supervision and inspection of law enforcement agents and employers on traditional management by agents of the employer, problems related to purchases of domestic and foreign orders and clearance of customs formalities and so on. Reducing the quality or the quality of a project implies the existence of obstacles and difficulties in the implementation of projects is the root The reconstruction and development of urban space is seriously threatened. [4].

Quality loss can have the following consequences:

- A) increase the total cost (direct and indirect costs).
- B) waste costs such as energy, insurance, rent, etc.
- C) the discontent of the people and undermine the credibility of the project
- D) reduce the reliability and safety of buildings built and the risk of casualties
- E) the disappearance of architectural value and beauty) and prolong the operation if the decision to restructure without quality.
- G) decreasing the useful life of the project
- I) lack of structural strength under constant gravity loads
- H) meeting and cracks in the walls of buildings
- G) lack of proper maintenance of the building.

Therefore identify the causes of reduced quality and roots of the projects is essential so as to minimize negative impacts. Thus, according to the contents expressed in this article to identify and evaluate the factors reducing the quality of construction projects with a phased approach and solution to improve beyond.

Background Research

In [1] study and evaluation of factors (cost, time, quality) on mass housing projects are carried out. were identified. Finally concluded that three factors have the greatest impact on time, cost, and quality mass housing projects are:

- Financial resources in comparison with similar organizations
- The quality design of the project in terms of taking details
- Quality of the financing of projects in terms of dealing with the lack of funding during the project

In [6] investigate the pathology of a city's quality management in construction. In this study, based on quality management processes, factors and were classified documents in the urban construction and mining studies and the opinion of experts, were identified as factors reducing the quality of urban buildings and were classified as follows:

1. violation of managing and controlling processes
2. Lack of proper implementation of laws
3. Distribution of responsibilities and lack of a proper work flow between them (decentralization of duty)
4. The lack of correlation between the reference regulation and building control authority
5. inadequate supervision
6. The use of substandard materials
7. Lack of quality insurance and ensuring the operation
8. lack of education and culture.

Finally came to the conclusion that today's urban construction quality management requires review and reform processes in the planning, assurance and control. The revision and correction, need to ask for the public, determination and participation of all experts and officials involved in this industry.

Chen and Lowe (2014) in a study to examine the use of BIM (Building Information Modeling) paid for the transfer of process design and is used to improve the design and design and construction quality by eliminating conflicts and reduce rework the be. This application contains, inspection and testing, analysis and feedback during the construction phase of the inspection results are. In this article the following as factors reducing the quality is classified:

1. inappropriate construction methods
2. Inappropriate design

3. Failure to use appropriate materials
4. The uncertainty and complexity of managing construction

Finally came to the conclusion that the key benefits of this model are as follows:

quality of projects is visible to participants in the project.

5. The improved design quality and increase productivity and reduce errors caused by lack of coordination between team members carefully

In [5] in a research study to create a key role in the quality of the iron triangle of cost, time, quality and importance of the organization's quality performance among key stakeholders to deliver a project's success criteria. The study consisted of three phases: (interviews, questionnaires approved by the Partial Least Squares PLS, case study). The study of the project's three dimensions of quality: quality design, quality and quality process to identify the organization and finally summary best practices for quality management provides that the results are as follows:

1. Quality management systems should be created to implement the project.
2. The quality management system must be created for suppliers and contractors.
3. methods for quality management project should RINCE, PMBOK, ISO, PMI is used.
4. The quality management system should be organized so that all accounting principles and is in full control.

In [7] the study examines the role and progress in improving quality performance results have been negotiated. According to this study, occurs when the difference of the project, the best strategy is to reduce the loss of time the project contractor, project quality assurance, and gain knowledge of the owner, try to resolve the conflict and achieve project success they can help to target. That total this paper emphasizes that the quality assurance contractor, the more points he will negotiate. 120 questionnaires were distributed for data collection questionnaire was composed of two parts. The first part of the background information of respondents difference and the second data collection for the study variables. In this study, regression adjusted MMR was used to quantify the effect of an independent variable. To analyze the data to analyze the main M.lfh (PCA) was used to obtain the weight of each factor or factors found to be more effective. Also to check the suitability of test data Kaiser- meyer-olkin (kmo) was used.

At the end concluded that:

- In the absence of a dispute over construction delays occur, could facilitate a better quality of work, reduce stress and gain more efficiency. - The effects of better quality, more power in bargaining relationships that

will lead to more cooperative attitude. - Better quality could improve the relationship with the owner[7].

RESEARCH METHODOLOGY

The aim of the present study, descriptive and to methods of navigation (survey) is. The aim of this study was to investigate the factors influencing the decline in competitiveness survey research projects are thus placed in the category. And since the results of this research can be used in the manufacturing of applied research as well. In this study population, the city of Marivan engineering community (including employers, contractors, consultants, students, etc.) is. In this study, sampling is random sampling. Random sampling methods to estimate the number of sampling error is expected that a certain sample possible. From a variety of random sampling, in this study, a simple random sampling method is used. In this type of sampling, sample evenly all participants have a choice. The sample size was determined using Morgan table is equal to 250. Because the sample size should be 250 exploratory factor analysis was used. The best way to assess construct validity factor analysis exploratory factor analysis and confirmatory factor analysis that the two species are carried out. With this analysis, we can determine whether the questions in the form of indicators to measure or not. Factor analysis of the questions are designed to assess an index or a trait, a common factor this time are significant factors[8].

There are two ways to select a sample using factor analysis:

1. For 5 to 10 are available. This method is useful when the number of variables. In our study the low number of variables or questions. Once a sample of 73 to 365 people (5 times) or 730 people (10 against) the problem seems possible sampling possibilities not allowed. So do not use this method for sampling.
2. According to previous studies has been proven

To do any research using factor analysis, a sample of 250 people to do is to answersAnd to find the precise answer will suffice.So our second sampling method we use to do your researchAnd the target population, a sample of 250 people were taken as a prototype.According to the study questionnaire and the statistical sample is two to determine the sample size. For this purpose 12 expert using snowball sampling were identified in 5 companies that have paired comparison questionnaire.Snowball sampling is a sampling possible when the units were not readily detected. Especially when these units are rare or make up a small part of a much larger community. In this method the alarm after identifying or selecting sampling the first unit, the second unit to identify and select sampling is used. Select one of the sample using this method, the Group

of 8 to 12 people are of First Instance. We own research maximum sample, a group of 12 samples were selected first as the second sample. In order to obtain information about the population studied, various methods can be used. Interviews, questionnaires and observations of people and the three major methods that are used in field studies.

In this study, given that aims to identify and prioritize the factors influencing the decline in the quality of construction projects. The researcher used two questionnaires. The questionnaire was designed based on the past and theoretical research. This questionnaire with Likert scale (five options) has been designed and consists of 73 questions. After performing exploratory factor analysis of the second questionnaire was reduced to 27 variables in five factors were categorized based on confirmatory factor analysis. The method of analyzing data depends on the purpose and nature of the subject and its executive facilities. The data analyzed in this study was descriptive and inferential analysis, to describe the variables in the form of tables and graphs, descriptive statistics sex, education, work experience, as well as a general description of the situation Respondents response to questions by SPSS 22 software is given. In the inferential statistics, exploratory factor analysis and confirmatory factor analysis for classification factors reducing the quality of the project in 5 of the 27 indicators that were identified using exploratory factor analysis was obtained. Then using fuzzy hierarchical triangle with Chang method (method development analysis) to rank the following factors and the factors discussed them. This study analyzes the structural equations using smart PLS software and SPSS statistical analysis was performed. The second consists of experts in the community that were identified through snowball sampling. These people have related education in the field of industrial and supply chain management, knowledge and experience in the supply chain. Through this sampling, 12 patients were identified who questionnaire (II) were paired comparison. The questionnaire through triangular fuzzy hierarchical data analysis using Microsoft Excel Chang were analyzed[13].

DESCRIPTIVE STATISTICS

In this part of the statistical analysis to measure the distribution of the sample in terms of variables such as gender, education level, field of study, work experience, work experience and age are discussed.

Sex

As can be seen in 30 patients (22%) of the respondents were female and 220 (88%) were male.

Table 1 in terms of gender composition of respondents in this research have been identified.

Degree of Education

As can be seen 50 patients (20%) with associate’s degrees, 186 patients (13%) have a bachelor’s degree, 14 (4%) had a master’s degree. Table 2 combination in terms of qualification respondents in this research have been identified.

Work Experience

As can be seen in 90 (80 percent) less than 5 years and 123 (20%) from 6 to 10 years and 37 (percent) have more than 10 years. Table 3 combination in terms of qualification respondents in this research have been identified.

INFERENCE STATISTICS

Exploratory Factor Analysis

The researchers tried to exploratory factor analysis exploratory factor analysis or empirical data to detect and identify indicators and the relationships between them. There is no specific model here before. In other words, exploratory analysis suggested the addition to the surveillance or may structuring, modeling or hypothesis is building. When the heuristic analyzer is used to pre-experimental research and previous evidence for the formation of hypotheses about the number of factors underlying data is not actually willing to covariate variables specifying the number or nature of the factors that justify the pains data. The analysis further exploration as a way to develop and produce a theory, not a theory test method is considered. In an exploratory analysis, the questions fall into different categories and within these categories

Table 1: Combination of respondents in terms of gender

Gender	The frequency	Percent
Woman	30	22
Man	220	88

Table 2: The combination of the respondents in terms of qualification

Degree of education	Frequency	Percent
Associate degree	50	20
Bachelor	186	74.4
MS	14	5.6

Table 3: Combination of respondents in terms of qualification

Years of service	Frequency	Percent
Less than 5 years	90	36
6-10 years	123	49.2
More than 10 years	37	14.8

depend on together. However we can say that the questions in a category, it's something that we're going to measure it, weigh. Exploratory factor analysis to assess the validity of the tests used kmo and bartlett. Table 4 in the two test results for validity, exploratory factor analysis, we see [14].

Bartlett's Test

Two situations may arise in the correlation matrix. The first mode is when the matrix of correlations between variables, and the same is a matrix in which case no significant associations. And thus allowed the identification of new platforms based on variables exist together. The second mode is when the correlation matrix is an identity matrix and, The off-diagonal elements of the correlation matrix of at least 0.3, in which case there will be no significant relationship between variables. So is it possible to identify and define new platforms. Bartlett test the null hypothesis states that the correlation matrix is an identity matrix unit. If that is the case for the structure (the agent) is inappropriate. If sig is smaller than 5% Bartlett test (reject the null hypothesis) factor analysis to identify the structure (the factor) is known as the assumed correlation matrix is rejected. According to Table 4, which approximate the chi-square test result Bartlett is shown. Bartlett's test sig value less than 0.05 indicates that the factor analysis to identify the structure factor model fit.

KMO Index

The index is used to determine the adequacy of sampling so that the partial correlation between variables K.chk review And determines whether the variance of hidden variables influenced by some basic common variance or not. The index is between zero and one. If the index is close to a (minimum 0.6), Data suitable for factor analysis are desired. Otherwise (usually less than 0.6), Factor analysis for the data to be useful. According to Table 4 KMO index with a value of 0.808 to mean that the number of samples is sufficient for exploratory factor analysis. At the end of the exploratory factor analysis of 27 variables or questionnaire or indicators grouped in five factors. According to the results of exploratory factor analysis on 73 variables, 27 variables questionnaire remaining questionnaire, 6 factors were identified as the main factors. The variables most correlated with each factor considered in operating, so we study 27 variables were categorized and sixth factor because of a question was removed.

Table 4: Exploratory factor analysis

KMO and Bartlett's test	
Kaiser-Meyer-Olkin measure of sampling adequacy	0/808
Bartlett's Test of Sphericity	15407/719
Approx. Chi-square	2701
df	
Sig	0/001

Confirmatory Factor Analysis

In confirmatory factor analysis confirmatory factor analysis or researcher looking for a model that assumes relatively little empirical data based on several parameters, describing explain or justify. is. Verification procedures (hypothesis) determined that data with a certain factor structure (that come in hypothesis) are coordinated or not. Standardized coefficients and significant coefficients in the confirmatory factor analysis (Student's t-test), questionnaire on each factor was obtained. To assess measurement models and confirmatory factor analysis three criteria: reliability, validity, convergent and divergent validity is [15].

Standardized Coefficients Confirmatory Factor Analysis Model

Saskatchewan was the Code: (factors related to the employer = A1), (factors related to consulting = A2), factors relating to the contractor = A3), (factors related to staffing = A4) and (factors related to machinery and materials = A5). The main sub-components of each factor based on the letter r sub-components Tdadh code and code stuff we've done stuff. The extent of the correlation coefficient for a more subcomponents more with their main factors and therefore more effective in reducing quality. In Figure 1 Standardized coefficients obtained for each factor is shown.

Significant Factor Confirmatory Factor Analysis Model

In this part, as did the standardized coefficients. The values obtained by the time the agent or standardized coefficients are the same. The time factor is the most significant factor is even greater. And therefore will be more effective in reducing quality. In Figure 2 achieved significant factor has been determined for each factor.

A significant criterion for determining the level of factor loadings

For the interpretation of the factors to be determined which of the handling agent should be considered as significant amounts. There are several criteria for the decision. Based on these criteria, the factor loadings are greater than $0.3 \pm$ are considered significant. Factor loadings are greater than $0.4 \pm$ a significantly higher level and greater than $0.5 \pm$ loads that are considered to be very significant. Therefore, the load factor is higher, they also interpret significant factor matrix increases. This criterion is used more in comparison with other criteria. In this research for better results and research power, that the agent was 0.6 times greater than chose their agent. In Table 5 we see the results of confirmatory factor analysis models.

Stability

Table 6 Cronbach's alpha and composite reliability of the variables specified amount for each five variables Cronbach's alpha values above 0.7 indicate good reliability model.

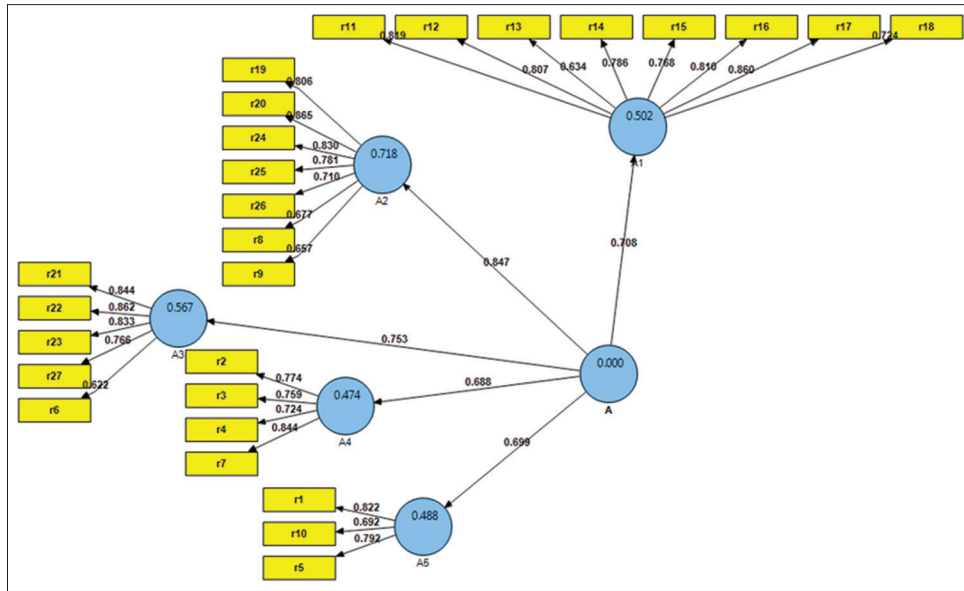


Figure 1: Standardized coefficients confirmatory factor analysis model

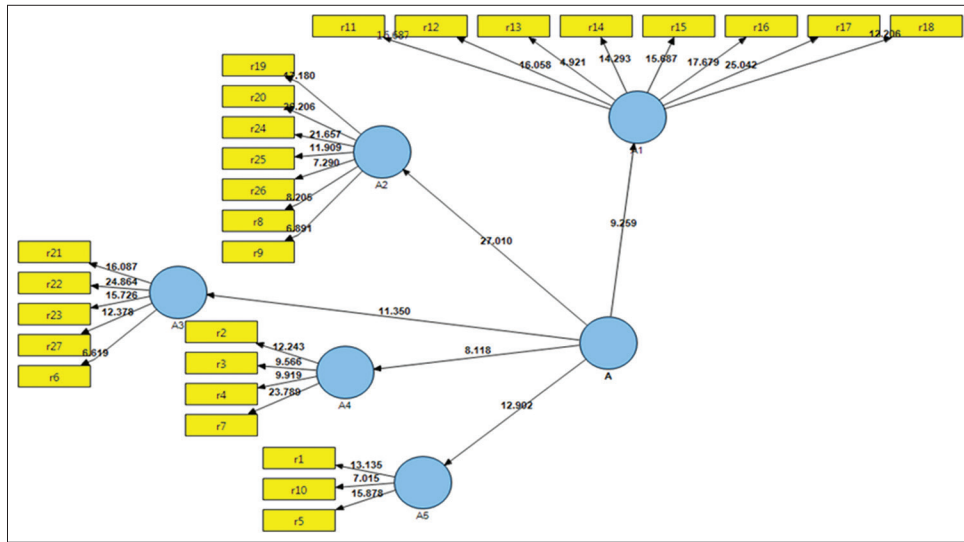


Figure 2: A significant factor confirmatory factor analysis model

CONVERGENT VALIDITY

When a new test available to test, to measure the same construct is made, the correlation is high, a new test to measure the lawful structures. These narratives tell convergent validity. Convergent validity, the correlation of each variable with questions (indicators) deals. Standard AVE (Average Variance Extracted) represents the average variance is shared between each variable with your questions. To put it simply AVE variable correlation with your question shows that the correlation is high, is more fitting. Fornell method and Larkr have introduced appropriate value for the AVE high 0.5. In Table 7 we see the average variance extracted of the study.

Given that the appropriate value for Cronbach’s alpha of 0.7, 0.7 for the composite reliability and AVE, 0.4 and all

the criteria to measure the right amount of factor loadings, the suitability of the reliability, and convergent validity study confirmed.

Validity

The test should other tests that measure different constructs, and divergent validity. This is called solidarity. square of the correlation coefficient between the structure) in a structure model. in this way, the correlation with its index against its correlation structures compared with other structures. In the diagonal of the matrix, root is entered AVE variables and divergent validity to confirm is necessary, this amount is more than the correlation between the variable and other variables. Average method, observed variance: This method is an alternative method based on factor analysis and Vlkr by Fornell (1981) were presented. In this way, when

Table 5: Summary results of confirmatory factor analysis models

Factor	Components	Load factor	Sig
Factors related to employer A1	Technical weaknesses of examined studies conducted by consulting employer in control of the employer deselect the appropriate personnel	0.819	16.687
	Customer relationships are the rule rather than holding tenders	0.807	16.058
	The uncertainty of negligence in the design and review design documents and maps	0.634	4.921
	Rush in opening some projects political and social reasons	0.786	14.293
	Priority technical issues of the project's finances	0.768	15.687
	Change in scope of works contracts and change orders	0.810	17.679
	Failure to meet the rebels on the appropriate human resources and delay in resolving them	0.860	25.042
	Hard undue interference of the employer	0.724	12.206
Factors related to consultant A2	Lack of adequate review in the preliminary stages of the project} {early studies.	0.677	17.180
	There are ambiguities in the map administrative errors	0.657	26.206
	Timely low accuracy in estimating volumes and lack of control Change values	0.806	21.657
	The major dispute with the employer and contractors	0.865	11.909
	Lack of decision-making power and incompetence of monitoring workshops	0.830	7.290
	Poor communication between advisers and other parties involved in the project	0.781	8.205
	Delays and lack of proper control tests in the investigation conducted by the employer	0.710	6.891
	Insufficient experience of contractors	0.622	16.087
Factors relating to the contractor A3	Timely workshop workshop equipment failure or inadequate equipment and lack of access to various parts of the project	0.844	24.864
	Ignoring machinery and methods for implementation	0.862	15.726
	Lack of effective management and control of subcontractors	0.833	12.378
	Choose a sub-contractor inappropriate	0.766	6.619
	Low productivity workers.	0.774	12.243
Factors related to staffing A4	Lack of facilities, leading to the lack of qualified personnel in the project is good	0.759	9.566
	Improper payments to staff and workers	0.724	9.919
	Shortages of skilled workers in the country	0.844	23.789
Factors related to machines and materials A5	Technical defects and poor management	0.822	13.135
	Lack of machinery and equipment	0.792	7.015
	Increased volatility and unpredictable price of materials and being forced to use poor-quality materials cheaper and more	0.692	15.878

Table 6: Stability

	Composite reliability	Cronbach's alpha
A1	0.924	0.906
A2	0.907	0.879
A3	0.891	0.846
A4	0.858	0.783
A5	0.813	0.764

Table 8: Fornell matrix and Larkr

	A1	A2	A3	A4	A5
A1	0.779				
A2	0.482	0.765			
A3	0.302	0.512	0.790		
A4	0.188	0.593	0.498	0.776	
A5	0.358	0.474	0.593	0.604	0.770

Table 7: The average variance extracted

	AVE
A1	0.607
A2	0.584
A3	0.624
A4	0.603
A5	0.593

there are differences between the two structures that the average variance explainedFor a larger construct of shared variance between them.For this purpose it is used

matricesThe squared covariance between any scale with other scales have been formed.To check the reliability of the main diagonal elements of the matrix with the index AVE, to be replaced when the validity of each of the elements on the main diagonal is larger than any other component of the row or column.

Fornell and Larkr to check the validity of the matrix is depicted in Table 8.

According to this table, we can conclude

Table 9: Fuzzy matrix of pairwise comparisons factors affecting project quality loss

Factors	(1)	(2)	(3)	(4)	(5)										
Factors related to employer	1.000	1.000	1.000	1.687	1.780	1.857	2.485	2.675	2.787	2.687	2.875	2.932	2.595	2.711	2.864
Factors related to consultant	0.539	0.562	0.593	1.000	1.000	1.000	1.589	1.654	1.723	2.323	2.430	2.501	1.432	1.434	1.504
Factors relating to the contractor	0.359	0.374	0.402	0.580	0.605	0.629	1.000	1.000	1.000	0.612	0.875	0.912	1.386	1.453	1.499
Factors related to staffing	0.341	0.348	0.372	0.400	0.412	0.430	1.096	1.143	1.634	1.000	1.000	1.000	0.612	0.854	0.907
Factors related to machines and materials	0.349	0.369	0.385	0.665	0.697	0.698	0.667	0.688	0.722	1.103	1.171	1.634	1.000	1.000	1.000

Table 10: ultimate weight loss factors affecting the quality of the project

Factors affecting the Quality Project	Non-normal weight	Normal weight
Factors related to employer	1	0.24001
Factors related to consultant	0.86843723	0.208434
Factors relating to the contractor	0.77632571	0.186326
Factors related to staffing	0.75805131	0.18194
Factors related to machines and materials	0.76367103	0.183289
Total	4.16648529	1

The validity of the model is as good as the square root of the AVE variables homes are located in the main diagonal matrix. And each main diagonal elements outside the main diagonal is larger than the other components. Table 5-8 Fornell and Larcker we see the results of the matrix. The numbers in the table using statistical analysis software smart PLS 1 (smart pls1) is obtained.

RANKING OF FACTORS RELATED TO CONSULTING USING FUZZY HIERARCHICAL ANALYSIS

Given that the number of experts in this method is 12, so 12 different matrix for each operating there. In the hierarchical fuzzy at first we turn this matrix to an identity matrix. Paired comparison tables to combine all respondents, one of the best methods is using a geometric mean. The reason for this is that the paired comparisons, data for the establishment and also the inverse matrix of paired comparisons justifies the use of this method mainly because of the negative effect on the geometric mean of paired comparisons matrix preserves.

If we assume a \tilde{a}_{ij}^k k-th component of the K-responsive to standard j is a benchmark for comparison, the geometric mean of the corresponding components is calculated by the following equation [16].

$$\tilde{a}_{ij} = \left(\prod_{k=1}^n \tilde{a}_{ij}^k \right)^{\frac{1}{n}} \tag{1}$$

$$\tilde{a}_{ij} = (\tilde{a}_{ij}^1 \otimes \tilde{a}_{ij}^2 \otimes \dots \otimes \tilde{a}_{ij}^{12})^{\frac{1}{12}} \tag{2}$$

According to the results of exploratory factor analysis of the questionnaire of 27 variables, five factors are identified as the main factors. Because the variables are highly correlated with each factor considered in operating, so we study 27 variables are classified as follows: Using the formula (2), matrices, matrix of pairwise comparisons between the following six factors are 12 expert and a pairwise comparison matrix between the factors we turn.

Table 9 Factors Affecting the geometric mean of experts' judgments show that the quality of your project. With this table and based on Chang, the final weight were essential factors influencing the quality of projects.

According to the experts about the importance of reducing factors affecting project quality, non-normal weight and normal weight (final) each factor was obtained. The normal and non-normal weight, the behavior of some factors as factors influencing the reduction in the quality of construction projects have been identified. When a component is normal or normal to have the least impact on reducing quality. Thus, we conclude that any of the factors that have a more normal weight, Normal and non-normal weights this study were obtained through hierarchical triangular Chang. Table 10 ultimate weight loss factors affecting the quality of the projects we see.

By weight, the priority is as effective factors on the quality of projects

CONCLUSION

The results of exploratory factor analysis of seven factors, including those related to the employer, the validity and reliability verification) fuzzy hierarchical analysis also revealed that the main sub-components of the following factors are affecting the quality loss:

1. Lack of machinery and equipment;

2. The increased volatility unpredictable cheap and low-quality materials and the use of materials;
3. Technical violations and poor management;
4. improper payments to staff and workers;
5. In countries that lack skilled workers;
6. Choose a sub-contractor inappropriate

But overall reduction in factors affecting project quality,

Factors relating to the client and the consultant are important operating and are in need of more attention.

Fuzzy analysis results showed that the order of priority:

1. The lack of machinery;
2. increased volatility and unpredictable and poor-quality materials and the use of cheaper materials;
3. Technical flaws and poor management;
4. The shortage of skilled workers in the country;
5. Choose a suitable sub-contractor;
6. improper payments to staff;
7. The lack of facilities for personnel;
8. Ignoring methods and machines to run;
9. The lack of experienced contractors;
10. timely workshop equipment failure or inadequate equipment;
11. The lack of effective management and control of subcontractors;
12. The low productivity workers;
13. The low accuracy in estimating volumes and non-;
14. undue interference and strict employer;
15. priority technical issues of the project finance;
16. The lack of decision-making power and incompetence of monitoring workshops;
17. Customer relationships rather than in tenders;
18. The uncertainty of the project;
19. The lack of preliminary studies project;
20. Failure to meet the rebels at the right time and the delay in resolving it;
21. The delay and lack of proper control in check by the employer;
22. technical weakness on the part of the employer's employer in the selection of appropriate personnel;
23. There is confusion in the plans of action;
24. The major dispute with the employer and the contractor;
25. Opening rush;
26. The consultant poor communication with other parties involved in the project;
27. Change in scope of works contracts and change orders

By exploring the studies carried out in conjunction with the factors affecting project quality,

What we consider the distinction, The priority and importance of the various countries and organizations.

As noted in this study, projects that addressed factors related to the employer and consultant, has been the main cause of decreased quality and more partially, the following factors, such as lack of equipment, lack of skilled workers in the country, select the appropriate sub-contractor, increased price volatility, materials and the use of poor-quality materials and have been identified as factors reducing the quality[17].reducing the quality of the project have introduced projects.But the results of our research was to study the effect of factors Abdi et al (1387) that factors such as poor quality of materials and the weakness of the agents involvedAnd khanjani Research and sugar (1393), factors such as inadequate supervision and use of substandard materialsAs well as research and Gvnaydyn Ardit in America (2005) that factors such as lack of proper management of the employer, the lack of proper supervision of the consultant and subcontractor selection inappropriate introduced as factors reducing the quality of matches if the expression was of course depending on the priority factors organization and the location was different.

REFERENCES

- [1] Khanjani, President, Sugar, varnishes, 2014, Pathology Vsazshhry quality management in the construction of the second international congress.
- [2] Heydari, Abraham, 2006, engineering management, publishing Khajeh Rashid, Third Edition, Hamadan.
- [3] The principle Hassan, gentleness, goodness; Bayati, Ali, Nasser, Hussein, afkhami, Ali; 2005, PM BOOK, Project Management Institute PMI, printing, Tehran.
- [4] Abbasi, Amir Attar, 2007, to evaluate and monitor the quality of residential buildings in Tehran, Disaster Management Conference, Tehran.
- [5] Glory Abdi, M., Zahedan, M; Makouei, A., 2007, factors affecting the poor quality of structures in Tehran, Iran Retrofitting National Conference, Yazd.
- [6] Khanzadi, Mustafa Pour opinion, conductor, born Younis something, H., R. Younes, Wahid assess the factors affecting the timing, cost and quality mass housing projects, the International Conference on Project Management.
- [7] Chua, D.K.H.Kog, Y.C.and Loh, P.K. (1999), "Critical Success Factors for Different Project Objectives,"Journal of Construction Engineering and Management.
- [8] Chan, A.P.C. and Tam, C.M. (2000), "Factors affecting the quality of building projects in Hong Kong,"International Journal of Quality & Reliability Management.
- [9] Talebitooti, R., Shojaeefard M.H., Yarmohammadisatri S.: Shape design optimization of cylindrical tank using b-spline curves. *comput. Fluids.* 109, 100-112 (2015)
- [10] Shojaeefard M.H., Khalkhali A., Yarmohammadisatri S.: An efficient sensitivity analysis method for modified geometry of Macpherson suspension based on Pearson correlation coefficient. *Vehicle Sys. Dyn.* 55, 827-852 (2017)
- [11] Shojaeefard, M.H., Talebitooti, R., YarmohammadiSatri, S.: Optimum Design of 1st Gear Ratio for 4WD Vehicles Based on Vehicle Dynamic Behaviour. *Adv. Mech. Eng.* 2013, 1-9 (2015)
- [12] Shojaeefard, M.H., Talebitooti, R., YarmohammadiSatri, S., Amiryoan, M.H.: Investigation on natural frequency of an optimized elliptical container using real-coded genetic algorithm. *Lat. Am. J. Solid Stru.* 11, 113 – 129 (2014)
- [13] Ardit, D. and Gunaydin, H.M. (2005), "Factors That Affect Process Quality in the Life Cycle of BuildingProjects," *Journal of Construction Engineering and Management.*
- [14] Chan, A.P.C.Wong, F.K.W.and Lam, P.T.I. (2006), "Assessing quality relationships in public housing: An empirical study," *International Journal*

Parsa and Pour: Factors Affecting the Decline in the Quality of Construction Projects

of Quality & Reliability Management.

- [15] LiJuan Chen, Hanbin Luo(2014), A BIM-based construction quality management model and its applications, School of Civil Engineering & Mechanics, Huazhong University of Science & Technology, Wuhan 430074, China.
- [16] Ron Basu,(2014),Managing quality in projects: An empirical study,

Henley Business School, United Kingdom,SKEMA Business School, France- international journal of project management.

- [17] Wenxue Lu, Jian Liu, (2014), Research into the moderating effects of progress and quality performance in project dispute negotiation, College of Management and Economics, Tianjin University, Tianjin 300072, China - international journal of project management.

How to cite this article: Parsa D, Pour SS. Identify and Assess the Factors Affecting the Decline in the Quality of Construction Projects with a Phased Approach and Solution to Improve. *Int J Sci Stud* 2017;5(3):191-200.

Source of Support: Nil, **Conflict of Interest:** None declared.