Construction Management　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　시공관리

Exploratory Factor Analysis of the Causes of Corruption in Iranian Construction Projects

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이란 건설 프로젝트의 부패 원인에 대한 탐색적 요인 분석

ABSTRACT

The majority of construction projects, from the initiation phase to the project completion and operation phase, are influenced by various types of corruption. Iran, as a developing country, has been suffering from this issue in bidding, tendering procedure, contracts etc. Therefore, due to the importance of this issue, this study attempted to identify the causes of corruption and evaluate the most significant factors in the construction projects in Iran. To this aim, an intensive literature review was performed to investigate the various types of corruption and identify the potential factors causing corruption in construction projects. The questionnaire survey was designed, considering twelve forms of corruption, including 77 causes of corruption in construction projects in Iran. Out of 220 distributed questionnaires, 188 were returned by the participants. The valid collected data sets were analyzed and then Exploratory Factor Analysis was applied. It was discovered that "Inappropriate power-sharing," "Lack of obligation for human resources to properly use resources and abide by the rules and regulations" and "Lack of any monitoring of the government's performance" are the most significant factors. Findings from the study would be valuable for the construction projects authorities and academia in order to combat corruption in the construction projects.

Key words : Corruption, Construction projects, Construction management, Exploratory factor analysis (EFA)

초 록

대부분의 건설 프로젝트는 초기단계에서부터 준공 운영단계에 이르기까지 다양한 유형의 부패에 영향을 받고 있다. 개발 도상국인 이란은 입찰, 투찰 과정, 계약 등에서 부패 문제로 어려움을 겪고 있다. 본 연구에서는 이란 건설 프로젝트를 대상으로 부패의 원인을 파악하고 그 중요도를 평가하고자 한다. 이를 위해 문헌연구를 통해 다양한 유형의 부패에 대해 조사하고 건설 프로젝트에 부패를 유발할 수 있는 잠재적 요소를 설문조사를 통해 파악하고자 한다. 설문지는 이란 건설 프로젝트에서 77가지 부패 원인을 포함하여 12 가지 유형의 부패를 고려하여 고안되었다. 수집된 설문지의 분석 및 탐색적 요인분석(EFA)을 통하여 "부적절한 권한 배분" 등 4가지의 주요 요인이 도출되었다. 본 연구 결과는 건설관계자와 학자들에게 도움이 될 것으로 사료된다.

검색어 : 부패, 건설 프로젝트, 건설 관리, 탐색적 요인분석(EFA)

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1. Introduction

Generally, corruption has various definitions, depending on the context and scope. One of the most common is defined by the World Bank as: "offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party." Corruption also occurs in the private sector and principal when an agent betrays the principal's interest in pursuit of one's own (Klitgaard, 1988).

However, globally, construction is distinguished as a sector associated with corruption (International, 2002; Kwan and Ofori, 2001; Wong et al., 2000; Zarkada-Fraser and Skitmore, 2000). According to Transparency International (2010, 2002), due to the rapid growth of construction business during these decades, recently it has been revealed that the construction industry has become the most corrupt industry. Annually, $340 billion US dollars was estimated as being lost due to the corruption in the global construction sector (Sohail and Cavill, 2008).

According to Sierra (2000) corruption is one of the main principal issues preventing economic and social development. It exists in both developed and developing countries and its occurrence is dependent on economic growth (Ehrlich and Lui, 1999). Inevitably, Iran, as a developing country is not an exception and numerous construction projects suffer from this issue in bidding, tendering procedure, contracts etc. Therefore, due to the importance of this issue, this study aimed to identify the root causes of corruption and highlight them for construction projects authorities. Hence, this study's objective is firstly, identifying the causes of corruption in construction projects, and secondly, to evaluate the most significant factors causing corruption in construction projects in Iran. To this aim, an intensive literature review has been performed which will be discussed in the following section. The methodology of this research and the procedures is explained in the third section. Data analysis and findings, and conclusion will be in the fourth and fifth sections respectively.

2. Main Discussion

2.1 Literature Review

An intensive literature review has been done in order to discover different forms of corruption as well as identifying factors contributing to corruption in construction projects.

Twelve different forms of corruption, occurred in the construction industry, identified from the previous studies in developed countries. Those twelve forms of corruption in construction are namely; bribery, fraud, collusion, bid rigging, embezzlement, kickback, conflict of interest, dishonesty and unfair conduct, extortion, negligence, front companies, and nepotism which are described as below:

1. **Bribery:** is defined as "offering, giving, receiving, or soliciting of anything of value to influence the action of an official in the procurement or selection process or in contract execution" (Hartley, 2009).

2. **Fraud:** occurs in the forms of misinformation, deceit, and theft (Bowen et al., 2007; De Jong et al., 2009; Sohail and Cavill, 2008; Tabish and Jha, 2011; Van den Heuvel, 2005; Vee and Skitmore, 2003).

3. **Collusion:** when a secret agreement is made between two or more parties for a fraudulent or deceitful purpose (Besfamille, 2004; Brockmann, 2009; Cheung et al., 2012; Chotibhongs and Arditi, 2012; De Jong et al., 2009; Sichombo et al., 2009; Tabish and Jha, 2011; Van den Heuvel, 2005).

4. **Bid rigging:** when a tenderee intentionally lets the tenderer win the contract (Bowen et al., 2012; De Jong et al., 2009; Hartley, 2009; Krishnan, 2009; Sichombo et al., 2009; Vee and Skitmore, 2003).

5. **Embezzlement:** when a person intentionally misuses their power to acquire unlawful personal benefits (De Jong et al., 2009; Green, 1993; Hartley, 2009; Stansbury, 2009).

6. **Kickback:** when a person looks for a favorable decision from a client's staff, in terms of unlawful economic incentives (Barco, 1994; Bowen et al., 2012; De Jong et al., 2009; Sohail and Cavill, 2008).

7. **Conflict of Interest:** when experts cannot fairly accomplish their duties due to personal interests or contradictory proficiency (Bowen et al., 2007; Bowen et al., 2007; De Jong et al., 2009; Hartley, 2009).

8. **Dishonesty and Unfair Conduct:** typically it arises in the bidding, contract negotiation and signing, and project construction phases (Alutu, 2007; Vee and Skitmore, 2003).

9. **Extortion:** it's an incentive for higher revenue, taken from

lower project positions; for instance from a major contractor to the subcontractors (Bowen et al., 2012; Cavill, 2006; Sichombo et al., 2009; Stansbury, 2009; Tabish and Jha, 2011).

10. **Negligence:** Vee and Skitmore (2003) identified some common form of negligence in construction as: insufficient project management skills, weak supervision, poor safety, low quality materials, insufficient quality requirements, and poor performance.

11. **Front Companies:** when senior positions in government establish corporate entities to get unlawful personal benefits during the awarding of construction contracts (Vee and Skitmore, 2003).

12. **Nepotism:** also called the "good old boys' network" (Singh and Shoura, 1999), is an assistantship with a tenderer who has a common race, origin or friendship (Bowen et al., 2007; Hartley, 2009; Kadembo, 2009; Ling and Tran, 2012).

Although extensive studies have been conducted in developing countries, it has been revealed through the literature review that just a few research studies have been performed in developing countries, such as India, South Africa, Nigeria, and Pakistan. In India, Tabish and Jha (2011) evaluated the irregularities in public procurement. They classified the irregularities into five categories as follows: transparency, professional standards, fairness, contract monitoring and regulation and procedural irregularities. Among these categories, transparency was ranked as the key factor. In South Africa, Bowen et al. (2012) identified that the factors facilitating corruption in the South African construction industry are "Shortage of skills and ineffective processes", "Public officials as role models", "Absence of deterrents and sanctions", "Poor standards of ethics." Bowen et al. (2007), discovered that collusion, bribery, negligence, fraud, dishonesty, and unfair practices are the verities of unethical behaviors encountered in South African construction projects. In addition, Bowen et al. (2007) indicated that the breaches in professional responsibilities include "conflicts of interest" and "the divulging of confidential and proprietary information to a third party". In Nigeria, Alutu and Udhawuve (2009) identified the various factors causing unethical practices in Nigerian engineering industries. Among those factors, the highest ranked factors were: "people want to acquire wealth by all means to enhance public status" and "people are driven by their inherent greed for money." Moreover, the two most prevalent unethical practices as perceived from the engineers' viewpoint are "contractors get vital information on the contract by paying agreed sums of money to officers of the awarding organizations" and "contractors must include 'kickbacks' in their tender or else they will not win the contracts" (Alutu, 2007). Corruption was revealed as one of the most important project risk factors in the construction industry in Pakistan (Choudhry and Iqbal, 2012).

Basically, corruption has different aspects such as social, economical, political, government, human resources, clients, management and organizational (Mousavi and Pourkiani, 2013). However, the studies regarding corruption in construction projects in developing countries are limited and ought to have more scrutiny on this topic.

2.2 Research Methodology

The aim of this study is to evaluate the most significant factors causing corruption in construction projects in Iran. Therefore, an intensive literature review has been conducted to discover various forms of corruption and the potential factors which encourage corruption in the construction industry. An initial questionnaire was designed by factors extracted from the previous studies. Through the pilot study, Twelve experts, in the Iranian construction industry, were interviewed and asked to evaluate and revise the questionnaire as to whether it was qualified and applicable or not.
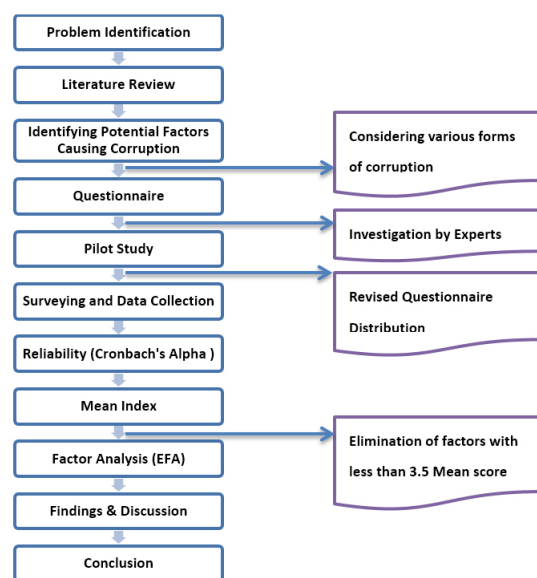

Fig. 1. Research Procedure Framework

The experts added some other affecting factors and omitted irrelevant factors from the questionnaire list. Consequently, the ultimate questionnaire included 77 factors (coded as FCC) and was distributed among the participants in Iran. The participants were asked to evaluate the importance of factors based on the five point Likert scale. Out of 220 distributed questionnaires, 188 were returned by the participants. The valid collected data sets were analyzed and the mean index for each factor calculated. The factors with less than 3.5 mean score were eliminated from the data set. Consequently, Exploratory Factor Analysis (EFA) was applied to analyze with 36 factors to uncover the underlying structure of variables. The research procedures framework is shown in Fig. 1 below.

2.3 Data Analysis and Findings

In order to check the reliability of the questionnaire, Cronbach's Alpha measured and discovered that $\alpha=0.734$ (Table 1). According to Field (2009), for the amount of α between $0.7 \leq \alpha < 0.8$ the reliability is "Acceptable".

According to Majid and McCaffer (1997) the factors with less than 3.5 score average mean index should be removed from the potential factors list, based on the appropriate classification of rating, shown on the Table 2. Hence, the factors less than 3.5 omitted and then data analyses proceed with 36 factors (Table 3). The average index (Mean Index) is calculated based on equation as follow:

Table 1. Reliability Statistics

Cronbach's Alpha	N of items
0.734	77

Table 2. Appropriate Classification of Rating

Rating	Rating scale	Classification
1	Very low or extremely in effective	$1.00 \leq$ Average Index score<1.5
2	Low or ineffective	$1.50 \leq$ Average Index score<2.50
3	Medium or moderately in effective	$2.50 \leq$ Average Index score<3.50
4	High or very effective	$3.50 \leq$ Average Index score<4.50
5	Very high or extremely effective	$4.50 \leq$ Average Index score<5.00

Table 3. Potential Factors Causing Corruption with Mean Scores in Descending Order

No.	Code	Potential factors causing corruption	Mean score
1	FCC03	Lack of social order	4.39
2	FCC13	Inequality in salaries and benefits of employees who are at the same level across different organizations	4.39
3	FCC42	Poor public culture in approaching government organizations	4.39
4	FCC52	Lack of obligation for human resources to properly use resources and abide by the rules and regulations	4.39
5	FCC33	Slow working/personnel dodging work	4.19
6	FCC72	Poor working culture	4.19
7	FCC22	Lack of any monitoring of the government's performance	4.19
8	FCC61	Vagueness of rules and bylaws	4.19
9	FCC32	Fatigue	4.02
10	FCC71	No rules for respecting the clients in an effective and operational manner	4.02
11	FCC10	Low economic growth	4.00
12	FCC49	Ineffective management at organizations	4.00
13	FCC17	Level of political freedoms and freedom to criticize the ruling class	3.99
14	FCC56	Inefficient administrative system	3.99
15	FCC07	High discrepancy between income of government and private sectors	3.87

Table 3. Potential Factors Causing Corruption with Mean Scores in Descending Order (Continue)

No.	Code	Potential factors causing corruption	Mean score
16	FCC46	Poor expert knowledge among managers	3.87
17	FCC28	Lack of proper human resource management for positions	3.86
18	FCC67	Lack of coordination among different administrative units and departments	3.86
19	FCC20	Inability of government to deal with corrupt founders	3.71
20	FCC59	Favoritism/discrimination in appointments and employment	3.71
21	FCC11	Lack of proper foreign investment	3.64
22	FCC50	Managers having multiple jobs	3.64
23	FCC16	Inappropriate power-sharing	3.59
24	FCC55	Non-existence of incentive system to motivate personnel	3.59
25	FCC38	Lack of coordination between personnel and clients	3.56
26	FCC77	Unnecessary competition among employees	3.56
27	FCC01	Gap between rich and poor	3.54
28	FCC36	Lack of job security	3.54
29	FCC40	Vagueness of job description of employees from the clients' point of view	3.54
30	FCC75	Lack of remote control system	3.54
31	FCC34	Abuse of information for private gain	3.53
32	FCC73	Lack of an accurate monitoring system	3.53
33	FCC15	Economic problems of employees and incongruity between their incomes and expenses	3.52
34	FCC54	Lack of proper payment system based on performance	3.52
35	FCC29	Weak relations between colleagues	3.52
36	FCC68	Lack of an efficient educational system	3.52
37	FCC30	Personnel dissatisfaction of salaries and benefits	3.45
38	FCC69	Low quality working life	3.45
39	FCC19	Lack of independent political parties and organizations	3.42
40	FCC58	Unfair use of resources (unfair distribution of resources)	3.42
41	FCC14	Lack of congruity between living standards of employees and their social status	3.40
42	FCC53	Lack of meritocracy/no-expert personnel occupying related posts	3.40
43	FCC31	Employees having multiple jobs	3.40
44	FCC70	Lack of proper accountability and transparency within the organization	3.40
45	FCC05	People's beliefs such as materialism, individualism, and consumerism	3.39
46	FCC44	Lack of proper human resource management	3.39
47	FCC25	Lack of an organic relationship between country's bodies and organizations	3.36
48	FCC64	No reasonable attention to the life of some organizations	3.36
49	FCC39	Lack of information due to the complicated nature of the work	3.29
50	FCC26	Lack of job satisfaction	3.15
51	FCC65	Lack of ethical policies	3.15
52	FCC21	Lack of genuine participation on part of people in running the country's affairs	3.10
53	FCC24	Chaotic situation and lack of cohesion	3.10
54	FCC60	Vagueness of tasks	3.10
55	FCC63	Lack of productivity in organizational structure	3.10
56	FCC09	Concentrated economy/government bureaucracy	3.05
57	FCC48	Expediency and failure to deal with corrupt senior managers	3.05

Table 3. Potential Factors Causing Corruption with Mean Scores in Descending Order (Continue)

No.	Code	Potential factors causing corruption	Mean score
58	FCC35	Personality problems of employees (faithlessness/ carelessness)	2.98
59	FCC74	Complicated guidelines	2.98
60	FCC06	Lack of religious faith or working conscience	2.94
61	FCC45	No separation between political and executive positions	2.94
62	FCC02	Increasing unemployment rate	2.84
63	FCC41	Passing clients from one room to another (complex bureaucracy)	2.84
64	FCC27	Lack of motivation	2.63
65	FCC66	Personnel having no knowledge about their tasks and responsibilities	2.63
66	FCC18	Level of political stability	2.52
67	FCC37	Clients' dissatisfaction	2.52
68	FCC57	Complicated administrative bureaucracy	2.52
69	FCC76	nepotism culture of administrative corruption	2.52
70	FCC04	Gap between social classes	2.48
71	FCC43	Clients having illogical expectations	2.48
72	FCC23	Expediency and failure to seriously deal with corrupt seniors managers	2.44
73	FCC62	Complexity of administrative organization	2.44
74	FCC08	Unequal distribution of wealth and monopoly	2.35
75	FCC47	Lack of management stability (no job security for managers)	2.35
76	FCC12	Problems caused by subsidies/making subsidies targeted	2.25
77	FCC51	Abuse of information for private gain	2.25

Table 4. KMO and Bartlett's Test

Kaiser-Meyer-Olkin measure of sampling adequacy.		.818
Bartlett's test of sphericity	Approx. Chi-Square	2769.068
	df	630
	Sig.	.000

$$Mean\ Index = \frac{\sum a_i x_i}{\sum x_i} \qquad (1)$$

Where, a_i = constant expressing the weight given to i

x_i = the frequency of response for i=1,2,3

Before applying the factor analysis, initially KMO and Bartlett's Test should be checked as to whether factor analysis is applicable or not. The KMO measure must be equal or higher than 0.6, and the Significance measure must be equal or less than 0.05 in the Bartlett's test. According to the Table 4, KMO was 0.818 and Significance for the Bartlett's test was 0.00 therefore they're qualified and factor analysis was applicable.

Exploratory Factor Analysis (EFA) was applied to uncover underlying relationships between measured variables. Therefore, the Principal Component's method with the Varimax rotation applied. From the EFA outcomes, the Total Variance Explained and the Rotated Component Matrix are shown in the Tables 5 and 6, including the factors with factor loading higher than 0.700.

3. Conclusion

This study attempted to identify the causes of corruption and evaluate the most significant factors in the construction projects in Iran. From the study, it was discovered that "Inappropriate power-sharing," "Lack of obligation for human resources to properly use resources and abide by the rules and regulations" and "Lack of any monitoring of the government's performance" are

Table 5. Total Variance Explained

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.198	19.996	19.996	7.198	19.996	19.996	3.716	10.322	10.322
2	5.162	14.338	34.334	5.162	14.338	34.334	3.417	9.493	19.815
3	2.210	6.140	40.473	2.210	6.140	40.473	3.092	8.589	28.404
4	1.593	4.424	44.897	1.593	4.424	44.897	2.998	8.327	36.731
5	1.485	4.125	49.022	1.485	4.125	49.022	2.152	5.978	42.709
6	1.329	3.693	52.715	1.329	3.693	52.715	2.055	5.708	48.418
7	1.296	3.599	56.314	1.296	3.599	56.314	1.774	4.928	53.346
8	1.141	3.169	59.483	1.141	3.169	59.483	1.745	4.847	58.193
9	1.016	2.821	62.304	1.016	2.821	62.304	1.480	4.111	62.304

Table 6. Rotated Component Matrix

Code	Factor Label	Component								
		1	2	3	4	5	6	7	8	9
FCC28	Lack of proper human resource management for positions	.701								
FCC52	Lack of obligation for human resources to properly use resources and abide by the rules and regulations		.817							
FCC16	Inappropriate power-sharing			.846						
FCC22	Lack of any monitoring of the government's performance			.804						
FCC13	Inequality in salaries and benefits of employees who are at the same level across different organizations				.798					
FCC03	Lack of social order					.707				
FCC61	Vagueness of rules and bylaws						.753			
FCC68	Lack of an efficient educational system							.795		
FCC71	No rules for respecting the clients in an effective and operational manner								.769	
FCC50	Managers having multiple jobs									.719

the most significant factors causing corruption in Iranian construction projects. Findings from this study would be helpful for construction authorities and project managers who are involved in construction projects in Iran as well as researchers in academia. A prospective research study will be how to prevent, combat, and eliminate corruption in our construction projects.

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