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Influence of Ethical Aspects on the Construction Industry Performance in Egypt

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Abstract

The construction industry is deemed to be one of the most flourishing industries in Egypt. It greatly contributes to the national GDP and represents one of the leading sectors in the Egyptian economy recorded at a reasonable growth rate recently. Throughout the history of work in mega projects, particularly in the petroleum, chemical industries and power plants, it has been noticed that erroneous technical, managerial and ethical behavior of personnel is dominant in the Egyptian work environment, which to a great extent affect passively the performance indices and success of the construction projects. Therefore, the aim of this research work is to introduce a model that describes the influence of ethical aspects on a number of selected performance indices used to measure the success of construction projects in Egypt. To this end, questionnaire surveys and interviews were used as data collection means. The questionnaire contained 185 questions covering 24 independent variables. The independent variables were selected to cover a number of critical technical, managerial and ethical issues that take place during the subsequent stages of large construction projects. In this research, only results concerning the influence of ethical aspects are presented. A number of statistical analysis tools were presented, using non-parametric analysis techniques and a number of regression models were developed to evaluate the project performance During both the planning and implementation phases. The study has detected three dependent performance indices that have been correlated with three ethical independent aspects.

Keywords

Construction industry, Project performance, Professional ethics, Non-parametric analysis, Regression model.

List of symbols

Symbol		Description	Symbol		Description
AWS	:	American welding society	Q , DV1	:	Quality
ASNT	:	American society for non-destructive testing	QA/QC	:	Quality assurance and quality control
BD, DV4	:	Brain Drain	RR,DV5	:	Reputational risk
C, DV3	:	Cost overrun	SD,DV2	:	Schedule delay
C.O.C	:	Code of conduct	SPSS	:	Statistical package for the social sciences
C.O.E	:	Code of ethics	TIG		Tungsten inert gas welding process
CWI	:	Certified welding inspector	U	:	Man-Whitney test
DI,DV6	:	Innovation and development	UK	:	United Kingdom
DCC	:	Document control center	US	:	United States
DVs	:	Dependent variables	USD	:	United States dollar
E	:	Ethical	V1	:	Lack of experience transfer
GDP	:	Gross domestic product	V2	:	Constructability sequence
H	:	Kruskal-Wallis test	V3	:	Material related problems
HSE	:	Health and Safety Executive	V4	:	Role of planning & human resources
IVs	:	Independent variables	V5	:	Role of HSE
K-S	:	Kolmogorov- Semenov test	V6	:	Role of training
LIII	:	3rd Level of non-destructive testing	V7	:	Role of administration services
LR	:	Logistic regression	V8	:	Corruption, Bribery and Bureaucracy
M	:	Managerial aspects	V9	:	Conflict of interest and Nepotism
OLR	:	Ordinal logistic regression	V10	:	Immoral behavior & Hypocrisy
PCA	:	Principal component analysis	V_i	:	Predictor variable
PMP	:	Project management professionals	Vs.	:	Versus
PWHT	:	Post weld heat treatment	WPS	:	Welding procedure specification

Greek letters

#	:	Item number	$\sum$	:	Summation
β_0	:	Intercept equivalent term	β_i	:	Slope coefficient

1. Introduction

Construction is an important industry for its huge output and it represents a significant part of the economy. Thus, construction is the catalyst which motivates the growth of a nation economy, especially during a recession. In most countries, construction provides approximately half the gross domestic fixed capital formation. The construction industry world represents 5.7% of the GDP in construction-related global spending annually in 2015 (Chia et al. 2018).

Moreover, the construction industry is comparatively a significant sector in both developed and developing economies. In developed economies, GDP contribution from the construction sector amounts to almost 10% and more than 4% with regard to developing economies. In Egypt, the construction industry is necessary for the economy and is considered to be one of the fast-growing fields. During several past decennium of the 20th century, the construction sector in Egypt achieved a considerable growth rate at an average of 9.7% per year. It similarly made a respectable assist to the economy, averaging 4.8 percent of the GDP in 2015 (Marzouk and Gaid 2018).

The construction industry is a mega sector in the UK economy. The sector employs around 3.1 million people in several roles, representing 10.5% of the UK employment and contributes up to 8% of the GDP (Akadiri and Fadiya 2013).

1.1 Motivation

Relying on literature review that will be presented in detail of the critical review. The research work in the field of performance and success evaluation of construction industry finds a great interest all over the world. However, there are comparatively discrepancies between the problems facing the construction industries and the proposed solution methods in different countries depending on the scientific class, financial power and cultural surroundings in each country or region.

Despite the truth that the construction sector in Egypt achieves around 4.8% yearly growth rate, comparing this development rate to other countries such as USA, India or Brazil, relatively large cumulative differences that could be minimized by improving the deficiencies in the performance of Egyptian construction sector.

The experience and lessons related to the construction industry in the Egyptian environment should be conveyed to individuals working in this area and to those who should read this research work to avoid losses and transfer experience to help readers, especially novices in construction.

Through scientific view, identification of the reality of this sector should be analyzed and studied in the hope of diagnosing its problems to define the closely significant reasons cause inefficient performance and trying to give a roadmap for the Egyptian corporations to getting better their technical, managerial and ethical aspects, providing solutions for its treatment and exploring ways of developing it, especially for the construction industry of Egypt.

2. Critical Review

Throughout the years, there have been several construction projects related problems that stimulated the author to pursue this research work. The author shall detect problems that have motivated him to trace the different issues that lead to losses illustrated with examples of personal experiences in the various fields of the construction industry in Egypt. Furthermore, through existing investigation research the author probe similar dilemmas, methods of data collection, the tools for statistical analysis, tests used and the findings of each study. Hence the need to conduct this research to cover and analyze some aspects of the Egyptian situation is essential.

In the paragraphs to come, many of the problems that have been detected are presented and limited only to ethical issues. Such problems and their related losses will be discussed in the following examples.

Negligence is a devastating problem that effects on erection and welding activities in the Egyptian construction field. Very important material and objects are lost as a result of misuse of them. The behavior of pipe-fitter who places the important objects in non-appropriate places where they get lost. The workplace must be planned to allocate a place for objects used in the work area. To solve this problem, it is necessary to plan temporary storage facilities in the workplace where the pipe fitter receives the objects used during the shift and return it back as soon as finishing the day work. As illustrated in Figure 1; an expensive spacer on the ground has shown and another expensive sockolet inside a hole of a flange as explained in Figure 2. In such places, they can be taken illegally or robbed and it was very inconvenient to be replaced. In one case, five sockolets were missing, because of this loss, the contractor contacted the designer and a new design was made without sockolets (see Figure 3), with high additional cost and delays, a new design was done by replacing missing sockolets with reinforcing plates and pipe nipples, this new solution necessitates the application of PWHT due to increased thickness.

In addition, a welding electrodes wasting is another example. Very often the inventory of certain type or a certain size of welding electrodes runs out of the store causing delays before supplementing this deficiency. The main reasons for running out of stock are mostly behavior as welders usually dispose of a large part of the electrode before taking a new one (see Figure 4) or use of the different size of the electrode rather than the size stated in WPS.

In conclusion, the above examples illustrate the extent of overlap and interrelationship between the various activities of the project in terms of technical, managerial and ethical aspects. Therefore, it is necessary to develop methods of control and measurement to identify imbalances and develop the appropriate treatment.

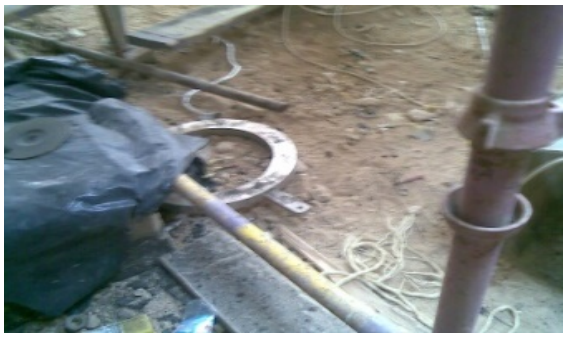

Figure 1. A real case illustrates missing spacer

Figure 2. A real case illustrates missing sockolet

Figure 3. The effect of lost material on piping design

Figure 4. A real case illusterates TIG electrode wasting

2.1 Literature Review

Construction is a multiplex assemblage of interdependent activities with unique characteristics that differ from other manufacturing processes. Most projects are not performed in superintended conditions and can be affected by foreign environmental and legal constraints (Shanthi 2017).

Egypt has an extended know-how, in the construction field started as the start as of the establishing of pyramids and during these centuries, there have been many problems especially that formed the culture of Egyptian people, some are positive, like the competence to act in a good manner and others are negative which will be discussed later.

In Egypt, there are many problems that could impede the success and cause delays to construction projects. These could be classified into three broad categories: problems related to owner 's responsibilities, consultant's responsibilities and others related to contractor’s responsibilities (El-razek et al. 2008 , Marzouk and El-Rasas 2014).

2.2 Project performance in the construction industry; success and failure

Researchers and practitioners concerned with construction industry suggested that construction companies are considered successful if their delivered projects meet the technical specifications, satisfy the internal project’s team and the external customers, and achieve the owner’s goals within the assigned budget and the planned schedule (Chan and Scott 2004, Munns and Bjeirmi 1996, Ribeiro et al. 2013).

Generally, it was revealed that most research work since the 80s and early 90s focused on one or two facets of the iron triangle, mainly cost and time when analyzing or evaluating the success of construction projects. Moreover, more interest has been focused on the managerial and technical aspects at the expense of ethical aspects. In addition, it will be shown that the literature mainly used three types of research methodologies:

1) Interviews and surveys based on questionnaires. 2) Statistical analysis of data available from reliable sources and organizations. 3) Proposed frameworks that discuss deficits in project performance and improvement strategies. In the following subsections, main ethical aspects found to impact the project success according to previous research works have been focused on.

2.3 Evaluation of factors influencing the overall project performance

Very often, the level of success of construction projects depends greatly on the quality, time and cost performance, (e.g. low quality of the executed work causes delays, fines, bad reputation, brain drain and hinders a pace of development and creativity) for contractors. Therefore, these variables have to be taken into account as performance indices. As per the authors' knowledge, the following performance indices have been vastly applied by the previous researchers.

2.3.1 Reputational Risk

In life and in business, reputation is everything. That said, reputation is so brittle and it only picks one mistake to cause irrecoverable prejudice to your company's image. In addition, reputation counts as a significant indicator of the contractor's performance. This occurs by looking at a contractor's previous experience to decide the grade of professionalism and experience in issues like quality, transactions and common behavior in a project besides the technical know-how (Marzouk et al. 2013).

Different professions, however, have different reputations insofar as ethical behaviors are concerned. According to a vote conducted by the journal of building, research and information, most construction contractors have notoriety for ethical performance in contrast with architects. The main problem being the high level of disputes between owners and builders (Vee et al. 2003).

2.3.2 Quality

Quality is an extremely critical issue in construction projects. Ethics and quality are well related to each other, as quality originated from ethical situations as an outcome of awareness-raising, culture and education. Charles Vee et al. developed a questionnaire for investigating the visions of practitioners on the major ethical issues surrounding construction industry activities. Most 90% subscribed to a professional C.O.E and many 45% had an ethical C.O.C in their employing corporations. It was agreed by 93% of the respondents that professional ethics should be driven by personal manners (Vee et al. 2003).

Moreover, Abdul Rahman et al. stated that the matter of occupational ethics plays a significant part in the quality-related problems of a construction project, (77.3%) of construction companies in Malaysia had been investigated, most of the respondents' firms practice their own C.O.E. The survey results revealed that 74.2% of the respondents come to an agreement that the construction industry is tainted by immoral behaviors (Hamzah et al. 2010).

2.3.3 Time schedule

Time is money to project owners, contractors, and subcontractors. Loss of significant income and the interest payments are a few of the main influential negative effects caused by schedule delays. Rateb Sweis et al identified and ranked the factors that are accountable for the lateness in the schedule of strategic industrial projects in Iran. In total, 40 factors grouped into 6 categories were identified to be essential for project schedule performance; one of these important groups was the political related problems including two ethical issues. The findings offer 14% for corruption and 9% for ethics in contractors' selection (Sweis et al. 2019).

2.3.4 Cost overrun

The second element of the triple constraint is recognized as a cost or resources such as manpower and materials necessary for the job. Concerning to outcomes on the pertinence between dishonest tendering practices and cost performance of projects in the Nigerian public sector, Patrick Ogbu et al found three contractor-related issues which include bribery presented by competitors to approach the confidential tendering data, as well as competitors, exaggerate their ability, experience, and qualification to get construction contracts. While clients and consultants- related

variables include; disclosure of further information to distinguish the bidder, criteria for selecting the winner not made public and the chief executive of the client interferes in tender evaluation and helps his/her chosen tenderer gain the contract affect the cost performance of projects (Ogbu et al. 2018).

2.3.5 Brain Drain

A negative impact on the psychological wellbeing of the individuals may result in dissatisfaction due to plenty of reasons such as insufficient income, repulsive working conditions, and very often leads to brain drain. An empirical study was conducted among construction professionals who left Malaysia after acquisition experience and working abroad to locate the main motive and attractive factors. The most significant reasons for leaving Malaysia are due to lower income received. However, other important motivations are related to personal attitudes such as to get exposure, curiosity, to challenge one's ability and also to live and work in a better environment (Ishak et al. 2014).

Abdalla F. Hayajenh et al stated that nepotism could affect job satisfaction and motivation, diminishing employees' work involvement and organizational commitment. Moreover, it may generate low morale, frustration and stress, regarding both employees generally and human resource managers. Finally, a serious outcome of such a situation could be a brain-drain (Hayajenh et al. 1994).

2.3.6 Innovation and Development

Innovation is an open, dynamic, multidimensional, and non-linear activity that can improve the value of products, processes, and services through the creation and the adoption of new knowledge. Innovation is the funding by which an industry advance taking either big pounces or slow development. In contrast, the construction industry, compared to the chemical industries or other manufacturing processes, it is not partly equipped for innovations and records slight progress in its main streams of activities; design and construction. While innovation in design may take place even on a project by project basis, in the mainstream of construction, this seems notably absent (Kulatilake 2016).

2.4 Tools for Statistical Analysis

For the realization of the objectives of the current study, a number of statistical analysis tools have been applied. The used techniques and tools are presented along with the necessary mathematical formulations. These tools include descriptive statistics, reliability testing (Cron- bach's alpha), normality testing (K-S test), non- parametric tests (e.g. U test and H test), and LR analysis.

2.5 The Aim of the Study

The objective of the study is to introduce a model that describes the influence of ethical aspects related to construction industry on a number of selected performance indices utilized for measuring the success of Egyptian construction industry projects.

3. Research Methodology

To detect the effect of ethical aspects on the performance of construction industry in Egyptian environment, firstly, an overall literature survey was done to explore the proper techniques and tools presented along with necessary mathematical formulations including descriptive statistics for the purpose of the study. Meanwhile, the methodology used to resolve problems in relation to the construction industry was studied to realize that could be applicable to the Egyptian environment. The identified causes of construction industry dilemmas were localized through interviews with ten highly experienced senior engineers who are professionally involved in the running of construction industry projects as their job. All of them have experience in the implementation of major construction projects for duration between 24 and 42 years. The interviewees were requested to include more reasons of construction industry problems that have repeatedly faced in their job. Moreover, brainstorming sessions among the author and experienced construction personnel have been held to investigate additional causes leading to delay of projects, losses, and fines for construction contractors specialized in Egyptian construction companies. Accordingly, a list of causes for common and most frequent problems of construction industry, including 43 items, was generated. The content was categorized and grouped based on the type of problem.

In a second step, a questionnaire survey was carried out to test the probability and importance of the identified 43 items. Before starting the survey, the quality of the developed questionnaire was approved by experienced specialists in the construction field as well as academicians and professors interested in industrial engineering. On the other side, a pilot study was conducted for the developed questionnaire for the measurement of the reliability between variables using the Cronbach alpha coefficient.

Afterwards, over 53 potential respondents from top Egyptian construction corporations were primarily identified and verified to be worthy for taking part in the study. The questionnaire was distributed among them to examine their quality for reliable filling of questionnaires. In this regard, questionnaires were submitted and sufficient time for each respondent was given to support him in case of any arising confusions.

The filled questionnaire was received by a rate of 83%, including 44 respondents comprised the basis for the current study whose characteristics are manifested in Figure 5, Figure 6 and Figure 7. For measuring the reliability of the respondent replies, the Cronbach alpha coefficient was used again and the preliminary questionnaire results were evaluated.Then, restructuring of the questionnaire to the final form was carried out to include independent and dependent variables. The questionnaire contained 185 questions covering 24 independent variables and 6 dependent variables. The independent variables were categorized into questions asking for technical, ethical and managerial issues which indicated in Table1,Table 2 and Table 3 respectively, while the dependent variables represent the performance indices were categorized into questions asking for such dependent variables which shown in Table 4.

The final survey form constitutes of 3 levels of project hierarchy includes top management, supervisors and employee issues. This paper focuses on the results considering the influence of ethical aspects only.

Respondents were requested to value the probability and significance of each case upon the Likert scale, where "1" shows very low probability or importance and "5" indicates a very high likelihood or impact. The validity of the data extracted from filled questionnaires was also examined by SPSS version 21. Cronbach's Alpha was calculated to be above 0.7 confirming the validity of the survey outputs.

Table1. Investigated technical problems associated with construction projects

#	Technical Problems
1.	Effect of project preliminary studies
2.	Design related problems
3.	Poor planning and HR
4.	Application of modern technology
5.	Poor training and qualification
6.	Constructability sequence related problems
7.	Material related problems
8.	HSE related problems
9.	Underestimated the role of DCC
10.	Unqualified technical office personnel

Table 2. Investigated ethical problems associated with construction projects

#	Ethical Problems
1.	Corruption, Bribery and Bureaucracy
2.	Conflict of interest / Nepotism
3.	Negligence /Complacency
4.	Dishonest conduct
5.	Collusion/ Fraud / Disloyalty
6.	Comme la habitute (Corporate couture)
7.	Immoral behavior / Hypocrisy
8.	Code of conduct

Table 3. Investigated managerial problems associated with construction projects

#	Managerial Problems
1.	Effects of low priced offers
2.	Routine of purchasing cycle
3.	Poor administrative services
4.	Crises management
5.	Lack of experience transfer
6.	Lack of communication and early warning

Table 4. Project performance indices used for measuring project success

#	Project performance indices
1.	Quality procedures implementation
2.	Time schedule delay
3.	Cost overrun
4.	Brain Drain
5.	Reputational risk
6.	Development and Innovation

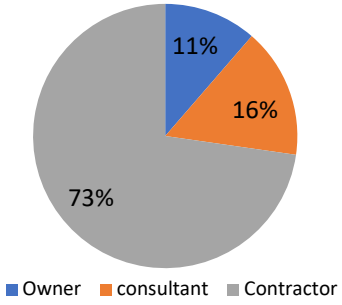

Figure 5. Responders organizational role

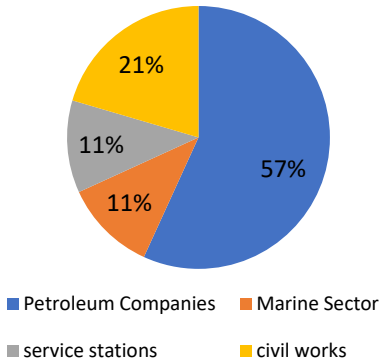

Figure 6. Responders working field

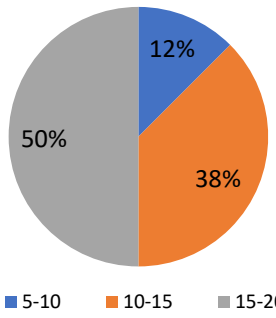

Figure 7. Responders related experience

The filled questionnaires were statistically analyzed; different statistical analysis methods have been used with a focus on OLR analysis models to conclude the effect of ethical aspects on the performance of construction industry in the Egyptian environment. The Analysis of results concerning independent aspects is shown in Figure 8, Figure 9 and Figure 10. Finally, discussion and recommendations have been presented for improving the negative aspects of the construction industry in the Egyptian environment.

4. Results and Discussion

In the following subsections, the analysis and test results of the OLR will be introduced. In addition, outcomes which contributed to achieving the purpose of the study will be focused on. Moreover, ideas and recommendations for improving the negative aspects and deficiencies of the Egyptian construction industry will be finally discussed.

4.1 Results of the OLR analysis

In the present analysis, we have looked at regression models that can be applied when our outcomes are represented by an ordinal variable. There is a strong association between factors that influence the performance indices even when p-values are less than 5%, performance indices used to evaluate the success of construction projects have been represented by six dependent variables:

1) The implementation of quality procedures [Q]. 2) Time schedule delay [SD]. 3) Cost overrun [C]. 4) Brain Drain [BD]. 5) Reputational risk [RR]. 6) Development and Innovation [DI].

The Analysis was completed using OLR to model the relationship among these dependent variables in accordance with the following equation: Performance index $= \beta_0 + \sum_{i=1}^{24} \beta_i V_i \ldots$ [Equation 1].

[Equation 1] contains the estimated coefficients for the model; the estimates labelled threshold are the $\beta_0 's$, the intercept equivalent terms, the estimates labelled location (Slope coefficients) are $\beta_i 's$, these are coefficients for the predictor variables expressed by $V_i 's$.

4.2 Regression analysis of the outcomes related to ethical issues

Findings have revealed that three common ethical variables listed in "Table 5a" are passively influencing three dependent variables only. Upon the OLR analysis, the effects of scoring weights on each of them are shown in Figure 8, Figure 9 and Figure 10 which concluded as follows:

1. Upon the quality model [Equation 2] and Figure 8, fighting corruption, bribery and bureaucracy (V8), (58% negative impact) is a crucial issue to enhance the quality procedure of the project.
2. In regard to the cost model [Equation 3] and Figure 9, it is perceived that plenty of influential variables are positively impacting the cost overrun including (V9) conflict of interest and nepotism (18%).
3. Immoral behaviour and hypocrisy (V10) are positively impacting Brain Drain (56%) as shown in and Figure 10.

4. From Table 5# a, b, c and d, it is noted that:

- Most significant models information were achieved (e.g. sig < 0.05)
- Goodness-of-Fit (Pearson =1.000), most models are good and having a large observed significance level.
- The strength of associations between dependent and predictor variables is highly satisfactory, 100% of respondents' sample can be presented in such models (e.g. Nagelkerke's R^2_N=1.000).

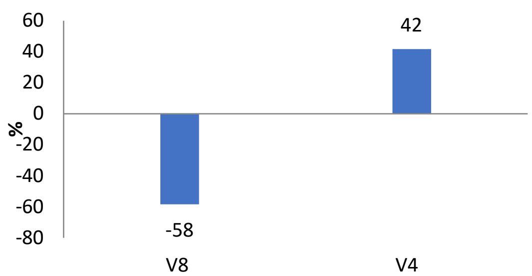

Figure 8.Percentages of scoring weights on quality procedure

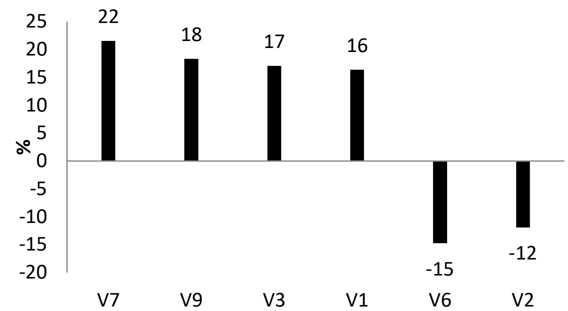

Figure 9. Percentages of scoring weights on cost overrun

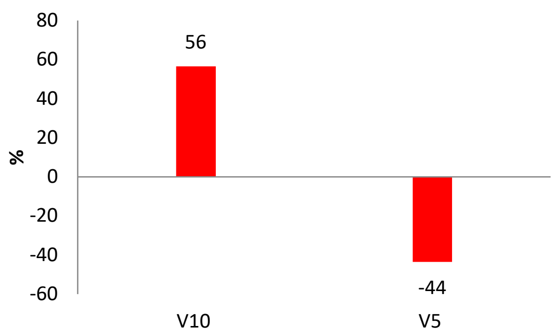

Figure 10. Percentages of scoring weights on Brain Drain

<u>OLR models:</u>

$\mathbf{Q} = \beta_0 - 9.707 * V8 + 6.923 * V4$…... [Equation 2]

$\mathbf{C} = \beta_0 + 2.369 * V9 + 2.111 * V1 - 1.535 * V2 + 2.204 * V3 - 1.904 * V6 + 2.782 * V7$……………………………….…. [Equation 3]

$\mathbf{BD} = \beta_0 + 8.093 * V10 - 6.233 * V5$…[Equation 4]

5. Conclusion and Recommendations

Ethical issues in the Egyptian construction industry have been investigated with a focus on the problems facing contractors implementing mega projects, which resulted in serious dilemmas including related problems to corruption, bribery, conflict of interest, nepotism, immoral behavior and hypocrisy. Based on the outcomes of the present study, the following points and recommendations have been concluded:

1. The Egyptian environment does not acknowledge the role of a whistle-blower while corruption has the greatest ethical effect on the project quality. More orientation is needed to appreciate such a role to prevent the occurrence of serious problems.
2. Lack of professional ethics is notable; however, these ethical problems could be solved by establishing C.O.E for the contracting companies. Such code has to be followed by all personnel especially the executive members.
3. A mechanism for reward and penalty for sticking fast or failing to comply with the proposed code should be applied on all hierarchy levels without exceptions.
4. Only if we emphasize introducing the ethical practices of applicants with their technical and financial offers before awarding contracts, will we benefit from the best employment of the qualified contractors.
5. It is periodically essential to move key persons, especially those who are working in the purchasing department and assign them for new positions to avoid alike conflict of interest.

Table 5.a-Impact of ethical aspects on project performance indices

#	Ethical issues		Category	OLR coefficients (estimates of β values)						Shown in
				Q	SD	C	BD	RR	DI	
				DV1	DV2	DV3	DV4	DV5	DV6	
1.	V8	Corruption , Bribery and bureaucracy	E	-9.707	None	None	None	None	None	[Equation 2]
2.	V9	Conflict of interest/ Nepotism	E	None	None	2.369	None	None	None	[Equation 3]
3.	V10	Immoral behavior / Hypocrisy	E	None	None	None	8.093	None	None	[Equation 4]

b- Model Fitting Information- DV1

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	99.323			
Final	0.000	99.323	23	.000

c- Goodness-of-Fit DV1

	Chi-Square	df	Sig.
Pearson	3.596	145	1.000
Deviance	6.461	145	1.000

d- Pseudo R-Square DV1

Cox and Snell	.895
Nagelkerke	1.000
McFadden	1.000

Quality model: $\boldsymbol{Q} = \beta_0 - 9.707 * \mathrm{V8} + 6.923 * \mathrm{V4}$

b- Model Fitting Information- DV3

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	110.335			
□inal	64.776	45.559	23	.003

c- Goodness-of-Fit DV3

	Chi-Square	df	Sig.
Pearson	339.052	145	.000
Deviance	64.776	145	1.000

d- Pseudo R-Square DV3

Cox and Snell	.645
Nagelkerke	.702
McFadden	.413

Cost overrun model: $\mathbf{C} = \beta_0 + 2.369 * \mathrm{V9} + 2.111 * \mathrm{V1} - 1.535 * \mathrm{V2} + 2.204 * \mathrm{V3} - 1.904 * \mathrm{V6} + 2.782 * \mathrm{V7}$

b- Model Fitting Information- DV4

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	95.866			
Final	0.000	95.866	23	.000

c- Goodness-of-Fit DV4

	Chi-Square	df	Sig.
Pearson	9.496	103	1.000
Deviance	14.630	103	1.000

d- Pseudo R-Square DV4

Cox and Snell	.887
Nagelkerke	1.000
McFadden	1.000

Brain drain model: $\mathbf{BD} = \beta_0 + 8.093 * \mathrm{V10} - 6.233 * \mathrm{V5}$

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