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Performance in Construction Industry In Post- Conflict Situations – Iraq As A Case Study

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ABSTRACT: *Construction projects in Iraq suffer from many problems and complex issues in performance such as time, cost, quality and safety. The aim of this study is to identify and evaluate the main factors affecting the performance of construction projects in this country.*
Literature review about the subject was carried out to identify the factors affecting the performance of construction projects. In addition, other local factors have been added as recommended by local experts and according to the researcher's own experience in implementing construction projects. A questionnaire survey was conducted and 50 factors were identified, categorized into 7 groups, evaluated and ranked from clients, consultants, and contractor's perspectives. In the survey conducted, 116 questionnaire sets were collected representing 36 clients, 38 consultants and 42 contractors in different parts of Iraq.
It was concluded that projects were delayed and the actual cost of projects was much more than their values because of Iraq's political and security conditions. Overall project safety factors had been moderately implemented in construction organizations.
It is recommended for construction organizations to have a clear mission and vision to formulate, implement and evaluate their performance. A structured methodology and technique should be identified to overcome the effect of local political and economic situations on the performance of construction projects. In addition, it is recommended to develop human resources in the construction industry through proper and continuous training programs about construction projects performance. It is necessary for construction organizations in Iraq to evaluate both of market share and liquidity before implementation of any construction project because of difficult economic situation. All of that will assist organizations to perform projects successfully and strongly.
Keywords: *Construction industry, performance measurement, Iraq*

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I. INTRODUCTION

Increasing competition forces companies to make strategic decisions in the long term. A successful performance management process which can be implemented through a comprehensive performance measurement system is a way for the organizations to see their status in the business environment and therefore make appropriate strategic decisions. However, comprehensive performance measurement systems are lacking in construction industry [1]. Moreover, the results achieved from the existing financial based performance measurement systems cannot be used to derive future performance. In the absence of a comprehensive performance measurement system, it is impossible to substantiate the status of the organization. Therefore, a comprehensive performance measurement system consisting of both qualitative and quantitative measures is needed for construction industry [2]. The proposed performance measurement system should be able to assess the performance of a construction company considering the performance of the projects operated, from different aspects of a project environment in line with the company and the project characteristics.

II. OBJECTIVE OF THE RESEARCH

The objectives of the research can be summarized as in the following:

- Identify the factors affecting the performance of construction projects- key performance indicators in Iraq which suffers of unstable economic and political situations.
- Determine owners, consultants, and contractors perceptions towards the relative importance of the key performance indicators of construction industry in Iraq in order to evaluate performance of construction

projects in this country and identify the most significant key performance indicators of construction projects in Iraq.

III. LITERATURE REVIEW

There is a comprehensive amount of research work concerning the subject of performance measurement in both developed and developing countries. The subject of performance measurement in countries suffering of complicated situation and conflict is not so much studied. The following is some of the research work concerning the performance measurement and the key indicator factors.Reference [3]introduced a construction company's approach to business performance measurement with a model constructed with two levels of outcome while [4] proposed a Performance Measurement Process Conceptual Framework for Construction Firms (PMPCF). On the other hand, [5]Proposed a contractor selection system that incorporates the contractor's performance prediction as one of the criteria for selection. [6] introduced an alternative theory developed of what constitutes quality, client satisfaction, performance and their interrelationships in the context of the construction industry. [7] stated that an organization's overall performance is influenced by the existing organization structure that is inherently complex with many interrelated components and modeled the dynamic performance of a construction organization. Introduced by [8], implementation of Six Sigma concept to construction provided a statistical indicator to measure the performance of processes or products against customer requirements .

Upon the principles of the balanced scorecard and business excellence models, [9]built a conceptual framework for measuring business performance in construction. [10] introduced a framework that combines resource-based and institutional perspectives for identifying the industry and company-specific factors that affect construction company performance. [11] examined the effect of information technology on company performance and found a positive association between them. [12] developed a performance evaluation model using the financial, economic and industrial characteristics of companies.

In their study, [13] stated that performance measurement systems have been one of the primary tools used by the manufacturing sector for business process re-engineering in order to monitor the outcomes and effectiveness of implementation. [14] obtained an evaluation framework to measure the efficiency of Building Project Management (BPM) by using conventional economic analysis tools such as time, cost and quality. [15] stated that performance measurement systems are imminent in the construction firms while[16] stated that effective and efficient management of contractors' organizational performance requires commitment to effective performance measurement in order to evaluate, control, and improve performance today and in the future .

From his study, [17] obtained that performance measurement is a complex issue that normally incorporates at least three different disciplines: economics, management and accounting. Measurement of performance has garnered significant interest recently among both academics and practitioners. The author remarked the choice of a suitable measurement technique depends on a number of factors, including the purpose of the measurement; the level of detail required; the time available for the measurement; the existence of available predetermined data; and the cost of measurement .

Based on the study carried by [18] he defined performance measurement as a comparison between the desired and the actual performances. For example, when a deviation is detected, the construction management analyzes the reasons for it. The reasons for deviation can be schematically divided into two groups: (a) unrealistic target setting (i.e., planning) or (b) causes originating from the actual construction (in many cases the causes for deviation originate from both sources). The studystated that performance measurement is needed not only to control current projects but also to update the historic database. Such updates enable better planning of future projects in terms of costs, schedules, labor allocation, etc. [19] stated that the measurement of project performance can no longer be restricted to the traditional criteria, which consist of time, cost and quality. There are other measurement criteria such as project management and products .

According to their research, [20] stated that measuring the performance of any construction project is a very complex process because modern construction projects are generally multidisciplinary in nature and they involve participation of designers, contractors, subcontractors, specialists, construction managers, and consultants. With the increasing size of the project, number of participants in the project also increases. The objectives or goals of all participants need not be same even in a given project. Hence to measure performance of a project without specifying the participant and without specifying the criteria for judging the performance holds no meaning. Past researchers have employed different criteria such as compliance to schedule, cost and quality to judge the project performance .

IV. RESEARCH METHODOLOGY

The research methodology can be summarized in the following steps:

Step one: Includes a comprehensive literature review, which supports the survey methodology, identified the research problem, and identified aims and goals.

Step two: This stage included data collection, using questionnaire from parties involve in the construction process (Client, Contractor, and Consultant) working in the construction projects in Iraq. Taking into account that existing data on construction performance in Iraq is very limited, a great deal of the research will be built according to the field investigation and local survey.

Step three: In this step analysis is made using data from the interviews, knowledge from literature review and the information about the performance of construction works in Iraq.

V. QUESTIONNAIRE DESIGN

A questionnaire survey was designed based on the objectives of the study.The survey was developed to get the opinion and understanding from the experienced respondents regarding to the construction performance problem. The questionnaires are all classified into two main sections:

Section one: Respondent Background

In this section, the researcher is trying to obtain the respondents' information. The questionnaire includes:

- Type of organization
- Typical of projects of organization
- Company size in terms of the number of employees.
- Job title of the respondents.
- Years of experience of the respondents
- Number of projects executed by the respondents in the last five years.
- Value of executed projects in the last five years

Section two: Factors affecting the performance of construction projects

The total number of factors considered in this study was 50, grouped into seven categories. These are:

- Time related factors – 10factors.
- Cost related factors – 12 factors
- Quality related factors – 6 factors
- Productivity factors – 7 factors
- Client satisfaction factors – 5 factors
- Community related factors – 5 factors
- Health, safety and environment related factors – 5 factors

VI. DATA ANALYSIS

The Relative Importance Index (RII) method is used here to determine owners, consultants and contractors perceptions of the relative importance of the key performance indicators in Iraq's construction projects. The Relative ImportanceIndex (RII)is computed as in [21, 20, and 22] :

$$RII = \frac{\sum W}{A \times N}$$

Where:

W is the weight given to each factor by the respondents and ranges from 1 to 5

A = the highest weight = 5

N = the total number of respondents

In this research, ordinal scales were used. Ordinal scale as shown below is a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the importance (1, 2, 3, 4, 5) do not indicate that the interval between scales are equal, nor do they indicate absolute quantities. They are merely numerical labels. Based on Likert scale as 5=Very high importance, 4 = High importance, 3 =Medium importance, 2 = Low importance and 1 = 1Very low importance.

VII. ANALYSIS OF THE COLLECTED DATA

7.1 The respondents characteristic's

7.1.1 Type of organization

The total number of questionnaire received was 116.Table 7.1 shows the frequency and percent of each type of organization who participated in the survey.

Table 7.1 Frequency and percent of each type of organization

Participant	Frequency	Percent
Client	36	31.0
Consultant	38	32.8
Contractor	42	36.20
Total	116	100.00

7.1.2 Typical of projects organization

The participants contributed to the survey were involved in different types of projects. Table 7.2 shows the percent of organizations projects types according to each type of target group.

Table 7.2. Percent of organizations projects type

Type of project	Client	Consult.	Contr.	overall
Housing	13.9%	21.0%	21.5%	19
General building	36.1%	36.9%	35.7%	36.2
Road and Transport	22.2%	13.1%	19.0%	18.0
Water & Sewage	16.7%	18.5%	16.7%	17.3
Others	11.1%	10.5%	7.1%	9.5
Total	100.00	100.00	100.00	100.00

7.1.3 Company size (number of employees)

The average number of employees in client's organizations is (66) employees. The average number of employees in consultant's organizations is 14 employees and the average in contractor's organizations is 120 employees.

7.1.4 Job title of the respondents

Table 7.3 shows the percent of job title of the respondent according to each type of target group.

Table 7.3 Percent of job title of the respondent

Job title of the respondents	Client	Consult.	Contr.	Overall
Project Manager	19%	15.8%	16.7%	19%
Site engineer	61%	60.5%	59.5%	60.3%
Organization manager	14%	18.4%	14.3%	15.6%
Other	06%	5.3%	9.5%	7%
Total	100.00	100.00	100.00	100.00

7.1.5 Years of experience of the respondents

Table 7.6 shows the number of projects executed by the respondent's in the last five years according to each type of target group.

Table 7.4 Percent to number of projects executed in the last five years

Number of projects	Client	Consult.	Contr.	Overall
1 to 3	5.6	2.6	9.5	6
4 to 6	33.3	39.5	42.9	38.8
7 to 10	47.2	36.8	47.6	43.9
More than 10	13.9	21.1	0	11.3
Total	100.00	100.00	100.00	100.00

7.1.6 Value of projects executed in the last five years (in million dollars)

Table 7.5 shows the percent value of projects executed by the respondent's in the last five years according to each type of target group.

Table 7.5 Percent of value of projects executed in the last five years

Value of executed projects	Client	Consult.	Contr.	Overall
1 to less than 2.0 M.$	8.3	1.9	10	6.8
2 to less than 5.0 M.$	14.6	18.5	18	17.1
5 to less than 10 M.$	37.5	24.1	24	28.8
More than 10 M.$	39.6	55.5	48	47.9
Total	100.00	100.00	100.00	100.00

7.2 Factors affecting the performance of construction projects

The results of this part of the survey provide an indication of the relative importance index and rank of factors affecting the performance of construction projects. The factors with significant effect (for each group) are considered as those which have values above the average of all factors within the group.

7.2.1 Time related factors

The average relative importance index for this group is 0.815. Table 7.6 shows the RII and rank of the significant factors affecting the performance according to time factors for clients, consultants and contractors and the overall results.

Table7.6 Importance Index and ranking of most significant time related factors

Factor	Client		Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Security measures	0.936	1	0.908	1	0.932	1	0.926	1
Unofficial holidays	0.878	2	0.850	2	0.888	2	0.872	2
Bureaucracy within the client's departments	0.863	3	0.843	4	0.861	4	0.849	3
Availability of resources as planned through project duration	0.856	4	0.845	3	0.818	5	0.841	4

It can be noticed that the most important factors affecting the project's time are security measures, unofficial holidays and bureaucracy within client's departments.

7.2.2 Cost related factors

The average relative importance index for this group is 0.811. Table 7.7 shows the RII and rank of the significant factors affecting the performance according to cost factors for clients, consultants and contractors and the overall results.

Table 7.7 Importance Index and ranking of most significant cost related factors

Factor	Client		Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Cost of security	0.942	1	0.904	1	0.966	1	0.938	1
Cost due corruption	0.894	2	0.845	2	0.922	2	0.888	2
Cost due to un-official holidays	0.856	3	0.842	3	0.894	3	0.865	3
Cost of variation orders	0.812	4	0.804	8	0.864	4	0.828	4
Profit rate of project	0.801	6	0.832	4	0.846	5	0.827	5
Project overtime cost	0.800	7	0.812	6	0.840	8	0.818	6
Waste rate of materials	0.795	8	0.814	5	0.84	9	0.817	7
Material and equipment cost	0.792	10	0.803	9	0.846	6	0.815	8

7.2.3 Quality related factors

The average relative importance index for this group is 0.737. Table 7.8 shows the RII and rank of the significant factors affecting the performance according to quality factors for clients, consultants and contractors and the overall results.

Table 7.8 Importance Index and ranking of most significant Quality related factors

Factor	Client		Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Conformance to specification	0.762	3	0.802	1	0.716	4	0.758	1
Quality of equipment and raw materials in project	0.802	1	0.702	6	0.756	2	0.752	2
Availability of personals with high experience and qualification	0.747	3	0.726	4	0.744	3	0.739	3

7.2.4 Productivity related factors

The average relative importance index for this group is 0.738. Table7.9 shows the RII and rank of the significant factors affecting the performance according to quality factors for clients, consultants and contractors and the overall results.

Table 7.9Importance Index and ranking of most significant productivity related factors

Factor	Client		Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Security measures	0.856	1	0.820	1	0.880	1	0.852	1
Un-official holidays	0.802	2	0.786	2	0.856	2	0.816	2
Absenteeism rate through project	0.764	3	0.756	3	0.804	3	0.776	3

4.2.5 Client's satisfaction related factors

The average relative importance index for this group is 0.693. Table7.10 shows the RII and rank of the significant factors affecting the performance according to client's satisfaction factors for clients, consultants and contractors and the overall results.

Table 7.10Importance Index and ranking of most significant Client satisfaction related factors

Factor	Client		Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Information coordination between owner and project parties	0.742	2	0.785	2	0.778	1	0.769	1
Speed and reliability of service to owner	0.762	1	0.753	1	0.744	2	0.753	2

7.2.6 Community related factors

The average relative importance index for this group is 0.650. Table7.11 shows the RII and rank of the significant factors affecting the performance according to community related factors for clients, consultants and contractors and the overall results.

Table 7.11Importance Index and ranking of most significant community related factors

Factor	Client		Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Problems with adjacent community	0.776	1	0.769	1	0.768	1	0.771	1
Neighbors and site conditions problems	0.742	2	0.756	2	0.767	2	0.756	2

7.2.7 Health, safety and environment related factors

The average relative importance index for this group is 0.652. Table 7.12 shows the RII and rank of the significant factors affecting the performance according to health, safety and environment related factors for clients, consultants and contractors and the overall results.

Table 7.12Importance Index and ranking of most significant health and safety related factors

Factor	Client		Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Application of health and safety factors in organization	0.785	1	0.795	1	0.764	1	0.781	1
Reportable accidents rate in project	0.764	2	0.758	2	0.762	2	0.761	2
Wastes around the site	0.675	3	0.648	3	0.676	3	0.667	3

7.3 Significant factors affecting the performance of construction projects

Table7.13 shows summary of ranking of the most significant factors. The average relative importance index for the 50 factors was 0.768.

Table 7.13Ranking of the most significant factors

Factor	Client	Consult.	Contr.	Overall	
	RII	RII	RII	RII	Rank
Cost of security	0.942	0.904	0.966	0.938	1
Security measures related to time	0.936	0.908	0.932	0.926	2
Cost due corruption	0.894	0.845	0.922	0.888	3

Unofficial holidays - time	0.878	0.850	0.888	0.872	4
Cost due to un-official holidays	0.856	0.842	0.894	0.865	5
Security measures - productivity	0.856	0.820	0.880	0.852	6
Bureaucracy within the client's departments - time	0.863	0.843	0.861	0.849	7
Availability of resources as planned through project duration	0.856	0.845	0.818	0.841	8
Average delay in payment from owner to contractor	0.801	0.812	0.846	0.828	9
Cost of variation orders	0.812	0.804	0.864	0.828	10
Profit rate of project	0.801	0.832	0.846	0.827	11
Project overtime cost	0.800	0.812	0.840	0.818	12
Waste rate of materials	0.795	0.814	0.84	0.817	13
Un-official holidays - cost	0.802	0.786	0.856	0.816	14
Material and equipment cost	0.792	0.803	0.846	0.815	15
Escalation of material prices	0.792	0.806	0.844	0.815	16
Project labor cost	0.802	0.786	0.804	0.797	17
Delay due to materials shortage	0.801	0.762	0.796	0.787	18
Application of health and safety factors in organization	0.785	0.795	0.764	0.781	19
Absenteeism rate through project	0.764	0.756	0.804	0.776	20
Local conditions	0.792	0.752	0.768	0.771	21
Problems with adjacent community	0.776	0.769	0.768	0.771	22
Differentiation of coins prices	0.766	0.758	0.786	0.770	23

8. Conclusions and recommendations

8.1 Conclusions

The main aim of this study was to identify the local factors affecting the performance of construction projects in Iraq. The aim was achieved through a structured questionnaire. The questionnaire assisted to study the attitude of clients, consultants and contractors towards key performance indicators in the construction industry.

Fifty factors were considered in this study and were listed under seven groups based on literature review. The main groups considered in this study were time, cost, quality, productivity, client's satisfaction, community satisfaction, and health-safety and environment. Number of sets collected was from 36 clients, 38 consultants and 42 contractors.

The results were analysed to obtain the most significant performance indicators. The relative importance index (RII) wasused to determine the parties' perceptions of the relative importance of the key performance indicators in construction projects.

The ten most significant performance factors in construction projects in Iraq based on the overall answers were: Cost of security, security measures related to time, cost due corruption, unofficial holidays – time, security measures – productivity, bureaucracy within the client's departments – time, availability of resources as planned through project duration, average delay in payment from owner to contractor , cost of variation orders.

8.2 Recommendations

The following issues are recommendations related to the obtained results.

- Develop human resources in the construction industry through proper and continuous training programs about construction projects performance.
- It is necessary for construction organizations in Iraq to evaluate both of market share and liquidity before implementation of any construction project because of difficult political and (recently) economic situation in Iraq.
- All managerial levels should be participated with sensitive and important decision-making. Continuous coordination and relationship between project participants are required through project life cycle in order to solve problems and develop project performance.
- Consultants should be more interested with design cost by using multi criteria analysis and choosing the most economic criteria in order to improve their performance and to increase owner's satisfaction.
- Contractors should not increase the number of projects that cannot be performed successfully. In addition, contractors should consider political and business environment risk in their cost estimation in order to overcome delay because of closures and materials shortage. There should be adequate contingency allowance in order to cover increase in material cost. A proper motivation and safety systems should be established for improvement productivity performance of construction projects in Iraq. More applications of health and safety factors are necessary to overcome problems of safety performance. Contractors are recommended to minimize waste rate through project implementation in order to improve cost performance

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