CIVIL ENGINEERING | RESEARCH ARTICLE

Identification of crucial performance measurement factors affecting construction projects in Iraq during the implementation phase

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Abstract: Construction industry has complexity in its nature because it contains a large number of participants as clients, consultants, contractors, stakeholders, shareholders, regulators and others. The topic of performance measurement becomes very crucial to construction projects to determine their success. Previous studies show the development of specific indicators for performance is among the most significant mechanisms for the measurement of performance. The main objective of this study is to examine and evaluate the systems for performance measurement adopted in the Iraqi construction projects during the implementation phase. This aim was achieved through structured interviews and a survey that was carried out among the different parties involved in the construction process. A total of 97 participants contributed to this survey representing public and private clients, consultants, and contractors. The analysis of the survey revealed that the most significant factors relating to the types of measurement systems in use are satisfaction of the client, the profitability of the project, viability and feasibility of the project, satisfaction of the project’s users, and quality of the project. The study

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Dr Salah Zamim has 35 years of experience in implementing buildings, civil engineering, and infrastructure projects in Iraq and the UAE. He gained his MSc and PhD in the field of Construction Project Management in the years 1998 and 2002, respectively. Currently, Dr Salah is an assistant professor at Uruk University/Iraq teaching many subjects in the field of Project Management and Economy at the undergraduate and postgraduate levels. Also, he is responsible for organizing many short courses related to continuing education. His research interests include risk, quality control, productivity, and application of Building Modeling in developing countries. He is the co-author of a book titled BIM in Project Management. Dr Salah is a member of many engineering institutions in Iraq and Jordan.

PUBLIC INTEREST STATEMENT

There is probably no sector that has significant implications on the daily lives of human creatures than the construction industry. Delay and cost overrun and other deficiencies in the Iraqi construction projects become a common phenomenon which had negative effects on project performance and parties involved in the construction process. Many studies and the researcher’s experience concluded weak performance, particularly with regard to the main performance indicators (cost and time) which showed a big delay in construction projects that normally exceeds 100% and in so many cases abandonment of the project.

It is from this background that the researcher tried to investigate and evaluate the systems in use for performance measurement at the implementation phase of the construction projects.

The findings showed the construction industry in Iraq is in desperate need of a more practical system for performance measurement to be adopted at in the implementation phase of the project.
revealed that all of the 20 indicators suggested in the survey might be utilized to shape the performance framework measurement of Iraqi construction projects at the implementation phase.

**Subjects:** Engineering Management; Engineering Project Management; Civil, Environmental and Geotechnical Engineering

**Keywords:** Iraq; performance measurement; performance indicators; analysis of variance (ANOVA); construction projects; the implementation phase

1. **Introduction**

The subject of performance measurement has considerable attention in the last three decades by experts and academics, e.g., Liu et al. (2015). The performance measurement topic was the interest of many researchers. These added considerable amounts of literature to this topic which becomes an important subject. Neely (1999) summarized seven reasons which make this subject significant. These are

- The inconstant nature of the construction project
- The increased level of completion
- The initiatives for improvement
- International and national awards
- The changing rules at the organizations
- External demand changes
- The effect of developments in information technology

The use of performance measurement to judge project performance, both in terms of the financial and nonfinancial aspects could improve program efficiency and effectiveness of construction organizations as recommended by Kelada (1999).

2. **The objective of the study**

The objective of this study is an attempt to examine and authenticate the systems for measurement of performance adopted through the implementation phase of construction projects in Iraq. This is carried out from the points of view of all parties involved in the construction process (clients—private and public, contractors and subcontractors, and consultants). Besides, the study reports the potential of the project’s performance indicators at the implementation of the construction projects.

3. **Literature review**

3.1. **Definitions of performance measurements and concepts**

The following are a sample of the definitions and their contest.

Cordero (1989) defined “Research and Development Performance” in the form of effectiveness and efficiency, where effectiveness indicates measuring output to locate and assist objectives accomplishment. The efficiency of this definition includes the measurement of resources to locate whether the least amounts are utilized in outputs or the final production.

A general definition of performance was presented by Dwight (1999) as the difference between the potential achievement of and the actual achievement of the goals. In the context of the organizational system, Rolstadas (1998) defined performance as a complicated mutual relation between seven criteria for performance. These are efficiency, effectiveness, productivity, quality, work–life quality, profitability, and innovation. In the context of product development, Doz (1996)
focused on the dimensions of performance in development and its speed. In the same context, Emmanueldes (1993) also defined the dimensions of performance and concentrated on the development time, the product development and the use of resources, and quality of total design. The performance level that has to be attained by a business is a function of the effectiveness and efficiency of the undertaken action. The measurement of performance, according to Neely (2005), means the operation of measuring the effectiveness and efficiency of an act.

Hester and Meyers (2012) defined the term as gaining and analysis of data and information about the existing possessors of the establishment’s goals, plans, and related factors. Also, a definition by Kagioglou et al. (2000) considered the performance measurement system as the operation at which the action is quantified where the process of measurement is related to quantifying the common activities related to performance.

3.2. Conventional vision of performance measurement
The conventional vision related to the measurement of performance is a complete function of planning and control. It is presumed that the measurement supplies a means of seizing data of performance necessary for taking the decision. This mechanical vision is integrated into the common judgment that the measurement of performance influences organizational attitude. Neely (1999) stated that people amend their attitude to guarantee a favorable performance consequence, even when considering unsuitable action.

Most of the companies measure their performance depending, mainly, on a financial scale, i.e. how much profits were made. Since considerable changes in the industry, especially in the new technologies development and competences increase, the financial approach is no longer sufficient. Criticisms by many researchers, Cheung et al. (2014) for example, were made to this approach because of its limitation to straightforward criteria like productivity and cost and not taking into consideration other significant criteria that are substantial for success.

Conventional indicators for performance are commonly focused on financial indicators like sales per worker or return on investment and earnings per unit. These financial related measurement tools are helpful, but give an indication of what occurred in the past and hence have a small ability to affect the elaboration of current performance. Besides, establishments that depend on financial measures would recognize their performance in the previous periods without recognizing the factors that affect the performance. Hence, it is important to find how performance was accomplished. These indicators, as mentioned by Neely (2005), are not convenient for modern business due to the following reasons:

• They are only suitable for short-term goals.
• Shortage of strategy of information on the quality, flexibility, and responsibility.
• Not convenient for continuous improvement.
• Local optimization support.

Many authors discussed the problems of "performance measures based on the financial measure". According to Amaratunga et al. (2001), these problems are:

• They are rarely integrated or aligned to the business processes.
• Measures are often poorly defined.
• Traditional performance measures that enterprises have used may not fit well with the new business environment and current competitive realities.
3.3. Performance management and performance indicators

Useful performance measurement can reflect the beneficial process of project management; it works as a technique that facilitates evaluation to be done, supplies useful data and information, discovers points of weakness, and permitting judgment versus specific predetermined standards to be achieved. The other important matter, according to Ong and Teh (2008), should be considered is the system has to be revised and updated as a continuous operation.

Performance indicators designate the measurable proof needed to demonstrate that a planned performance has accomplished the required results. In another term, when indicators can be assessed with some level of accuracy, and without confusion they might be designated as measures. While, when it is not likely to get an accurate measurement, they are commonly designated as performance indicators. According to Sinclair and Zairi (1995), the measures of performance are the quantitative or numerical indicators. Also, Mbugua et al. (1999) concluded that measurement of performance is an orderly way of assessing the inputs compared with outputs in implementing construction activity and works as a device or instrument for constant elaboration.

Sohail et al. (2002) concluded that one of the potential causes of the deficiency in the monitoring of performance in public sector projects in developing countries is the non-availability of trustworthy performance indicators. There is no trustable criterion that can be adopted for evaluating the performance of the project during the different phases of its implementation.

The main stakeholders involved in the construction process (client, contractor, consultant, supplier, and end-user) requirements and expectations have not come true or highlighted. The priority order of factors like time, cost, and quality among different stakeholders involved in the construction of the project could inspire discrepancy among them. The outcome of this could be a project completed within many complaints and probably legal cases being raised and conflict in settling them. Meanwhile, Cooke-Davies (2002) stated that the project’s performance relies on the parties who were involved in the management of this project and is most likely to depend on the suitable staff having the correct information provided at the correct time.

Bekr (2015) concluded in his study that in Iraq, there are many construction projects fail in performance. Also, performance measurement systems are not effective or efficient to overcome this problem. There are many constructed projects that fail in time performance, others fail in cost performance and others fail in other performance indicators. In the last 10 years, there were many projects which finished with poor performance because of many evidential reasons such as security issues, obstacles by the client, non-availability of materials, road closure, amendment of the design and drawing, additional works, waiting for the decision, handing over, variation order, amendments in Bill of Quantity (B.O.Q) and delay of receiving drawings as mentioned by Abdulsattar (2017). There are other indicators for problems of performance in Iraq such as project management, coordination between participants, monitoring, and feedback and leadership skills. Also, Obaid and Habinid (2019) mentioned that political, economic and cultural issues are three important indicators related to failures of projects’ performance in Iraq.

3.4. Research works related to performance measurement in developing countries

Researchers from developing countries published many articles that considered the effective factors in the field of project performance. In the United Arab Emirates, a study by Faridi and El-Sayed (2006) considered factors that have a significant effect on time overrun in this country. The study concluded that the most significant factors are lack of skilled labor, poor on-site management and supervision, inappropriate leadership, lack and problems with types of machinery, etc. In the Gaza Strip, a study by Enshassi et al. (2009) revealed many factors that have a considerable effect on performance measurement. Some of these are time, cost, quality, the satisfaction of the client, the performance of the business, health, and safety, manpower, and pieces of machinery productivity, environment effect, and other factors.
Another research by Hanson et al. (2003), considered the reasons for the non-satisfaction of the clients in the building and construction industry in South Africa, revealed the factors affecting negatively the client’s satisfaction are a discrepancy, lack of skilled labor, and contractor’s incompetence. In the same country, a study by Mbouche and Nkando (2007) determined that the quality position to duties is the most significant factor that affects the success of the delivered projects. From the same region, in Zambia, the contractor’s performance, according to a study by Zulu and Chileshe (2008) proved to be lower than expected. The studied projects found have considerable cost and time overruns.

There are many dimensions that could be utilized to evaluate the performance of the project. The most common are cost, time, and quality. Pheng and Chuan (2006) added two widespread groups of indicators. The first one is concerning the users, the general public, stakeholders, and the common public. The other set covers the contractors or the developers. One or more indicators may be included in the dimensions of the performance. They could be affected by different characteristics of the project. In this contest, Dissanayaka and Kumaraswamy (1999) established in their research the project characteristics, a system used for procurement, the performance of project’s team, characteristics of client’s and contractor’s staff, the design expertise and their capability, external and unexpected conditions. All the mentioned factors would affect the project’s performance and more precisely the project’s time and cost.

The performance of the project cost might be affected by many other factors. Iyer and Jha (2005) mentioned that among them are the competence of in-charged project’s manager, support provided by the top management, leadership and coordination capability of the project’s leader, the competence of the owner’s representatives, social and economic conditions, and the effect of weather. A model by Elayanany, et al. (Elyamany et al., 2007) proved to be useful for construction companies that could be a useful tool for stakeholders, company owners, and fund providers, to assess the performance of Egyptian construction firms.

4. Research methodology
The adopted methodology for this study was set up on a surveyed questionnaire, and interviews targeted three main groups within the Iraqi construction industry concentrating on the main cities in the middle region of Iraq. The collected data were carried out between January and June 2019.

The author conducted eight in-depth interviews with respondents from contractors as well as the Ministry of Works and Housing and the Ministry of Transport to get their view of the performance of the construction sector in Iraq. Structured interviews as described by Bryman and Bell (2011) were chosen because of the flexibility that allows the interviewer to ask follow-up questions and also to deviate from ordering of the questions. According to Blair et al. (2013), the interviews are useful to delve into issues that should be included in the questions, develop response alternatives, and learn potential respondent’s views on certain topics.

The choice of interview questions was based on the literature review, and the questions were designed to reflect the opinion of the main parties involved in the construction process. The face-to-face interviews lasted between 25 and 35 minutes focused on a few crucial questions. To reduce misunderstandings related to terminology, all interviews were conducted in Arabic. The interviews participated in the process of questionnaire design and selection process of the questions.

The questionnaire sets were distributed to the three main groups. These are clients—public and private, contractors, and consultants. The participants represented different kinds of expertise including planners, design engineers—in different fields, project managers, and project developers. Samples were selected, randomly, from a very long list which was provided by different institutions like Engineers Union, Contractors Union, and other professional bodies.
4.1. Questionnaire design
In this survey, the quantitative approach was adopted to examine the current performance measurement systems in use during the implementation phase and the capability of the proposed performance indicators in the construction industry in Iraq. The questionnaire was formatted through the following steps:

- The primary design of the questionnaire was prepared in the light of knowledge published in the literature and the face-to-face interviews.
- External experts and specialist’s judgment.
- The long experience of the researcher’s in implementing construction projects in Iraq.
- The pilot study was utilized to modify the initial questionnaire. This modification was based on the recommendations and suggestions from two clients, two consultants, two contractors, and two developers. This was done to identify and minimize any form of ambiguity with the survey instrument.
- Modification and alterations based on the pilot study.

4.2. Structure of the questionnaire
Based on the above-mentioned points, a list of 17 various kinds of measurement utilized in construction projects development was created for the participants to distinguish their level of implementation in Iraqi construction projects. Participants were also requested to evaluate the measurement systems actually in use. Besides, a list of 20 performance measurement indicators was prepared for the participants to give their views on the range to which they influence on the different stages of the life cycle of the project. Participants were requested to rate their reply on every single question on a five-point Likert scale (1–5), where “5” represents very important and “1” not important. The questions included in the questionnaire sets were designed as a “close-ended” style directed towards facilitating the accomplishment, thus reinforce the answering rate, as recommended by Diakwa (1990). The answers obtained were analyzed by adopting the SPSS-Software (Statistical Package for the Social Science). The conducted statistical analysis comprises the mean value and ranking (descriptive analysis).

5. Results

5.1. The sample size and characteristics
Statistical equations were used to calculate the sample size for the study population. Equation 1 was used to determine the sample size (Creative Research Systems, 2016).

\[ SS = \frac{Z^2 \times P \times (1 - P)}{C^2} \]  \hspace{1cm} (1)

where \( SS \) is the: sample size

\( Z \) is the \( Z \) value (e.g., 1.96 for 95% confidence interval)

\( P \) is the percentage picking a choice, expressed as a decimal, (0.50 used for sample size needed)

\( C \) is the confidence interval, expressed as decimal (e.g., 0.05 = ±5)

Correction for the finite population was carried out using equation 2:

\[ SS_{new} = \frac{SS}{1 + \frac{SS \times P}{POP}} \]  \hspace{1cm} (2)
Table 1. Number of questionnaire sets sent and received

| Type of establishment               | Number sent | Number received | Return % |
|-------------------------------------|-------------|-----------------|----------|
| Client (government departments, private developers, etc.) | 50          | 32              | 64       |
| Consultants                         | 50          | 30              | 60       |
| Contractors/ Subcontractors/Suppliers | 50          | 35              | 70       |
| Total                               | 150         | 97              | 65       |

where pop is the population

Table 1 presents the number of questionnaire sets sent and returned for various groups of participants in the Iraqi construction companies and establishments. According to Baruch and Holtom (2008), the response rate achieved was 65% which is acceptable. The good response rate achieved was due to many reasons, among them is the researcher’s relationships with so many officials who represent the establishments and government officials, also the assistance from many friends working in the construction field.

The characteristics of the sample may be summarized by the points listed below:

- The respondents, in general, are highly educated (More than 70% hold BSc). The others are post-graduates.
- The majority of the respondents who participated in the survey have experience of more than 15 years in their fields.
- More than half of the respondents are from the capital (Baghdad), while the others are from different cities in the mid-region.
- All the participants were selected from large government departments, private clients and companies, a consulting firm, and large-scale contracting companies. This is represented by the size of work undertaken and the number of employees.

5.2. Analysis of questionnaire results

5.2.1. Statistical tests
A Kolmogorov–Smirnov test was utilized to test whether the data were normally distributed or not and as recommended by Tabachnick and Fidell (1996). The significant value was less than 0.05 which specified significant results, recommending that the non-parametric system would be more convenient for the analysis. The other tests are the reliability and validity test, as recommended by Leedy and Ormrod (2001), were carried out to ensure obtaining an accurate result. The five-point Likert scale reliability on the sample was specified relying on Cronbach’s alpha coefficient. The value for alpha, as recommended by Pallant (2001), should be higher than 0.70. Thus, Cronbach’s alpha results of the used Likert was 0.821 for this study, marking that the collected data from the survey were interdependent and the scale was consistent with the sample.

5.2.2. Ranking of measurement types
The results were analyzed using the Statistical Package for the Social Sciences (SPSS) software. Statistical analyses conducted include descriptive analysis (mean value and ranking) and inferential statistic (Kruskal–Wallis of one-way ANOVA and a Wilcoxon signed-rank test of two related samples).
| Measurement types                        | Client | Consultant | Contractor | Overall |
|-----------------------------------------|--------|------------|------------|---------|
| % Measured                              | Rank   | % Measured | Rank       | % Measured |
| Performance of contractor               | 88.2   | 1          | 86.7       | 1        | 91.6 | 1   |
| Quality of the project                  | 84.7   | 2          | 86.2       | 2        | 874  | 2   |
| Financial measurement                   | 76.3   | 6          | 84.3       | 3        | 86.1 | 3   |
| Performance of the project              | 82.5   | 3          | 80.2       | 4        | 77.4 | 6   |
| Feasibility and viability of the project| 81.5   | 5          | 78.3       | 8        | 78.9 | 5   |
| Satisfaction of the client              | 82.3   | 4          | 79.4       | 6        | 73.4 | 7   |
| Performance of Project Manager         | 68.47  | 10         | 78.4       | 7        | 80.1 | 4   |
| Productivity of the project             | 74.2   | 8          | 72.6       | 9        | 73.1 | 8   |
| Number of accident (safety measurement) | 74.5   | 7          | 72.1       | 10       | 65.3 | 11  |
| Performance of consultant               | 65.4   | 12         | 79.3       | 5        | 63.7 | 12  |
| Performance of project’s team           | 65.9   | 11         | 66.3       | 12       | 65.4 | 10  |
| Performance of client’s staff           | 72.2   | 9          | 66.6       | 11       | 60.7 | 15  |
| Performance of suppliers                | 61.4   | 13         | 60.7       | 15       | 70.3 | 9   |

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(Continued)
| Measurement types         | Client | Consultant | Contractor | Overall |
|---------------------------|--------|------------|------------|---------|
|                           | % Measured | Rank | % Measured | Rank | % Measured | Rank | % Measured | Rank |
| Project's brief perfection| 60.1   | 16 | 64.2       | 13 | 61.3 | 14 | 62.8 | 14 |
| Briefing process efficiency| 60.4 | 15 | 60.8 | 14 | 61.8 | 13 | 60.9 | 15 |
| Performance of users      | 61.2   | 14 | 60.3       | 16 | 57.6 | 16 | 59.4 | 16 |
| Satisfaction of employees | 59.4   | 17 | 58.7       | 17 | 56.3 | 17 | 58.9 | 17 |
| Average                   | 71.68  |    | 72.65      |    | 71.2 |    | 71.96 |    |
5.2.3. Performance measurement systems adopted in Iraq

The outcome of the survey concerning the 17 different measurement types adopted in construction projects development at the implementation stage in Iraq is shown in Table 2.

The analysis of the results revealed that all the three parties involved in this survey agreed that the performance of contractor and quality of work is the most significant performance measures with overall percentages of 87.5 and 86.3, respectively. These results are consistent with other research works like Egan (1998), Brown et al. (2001), Construction Industry Task Force (1998), Arditi and Gunaydin (1998), and Construction Industry Development Board Malaysia (CIDB, 2000).

According to Liu and Walker (1998), the overall contractor’s performance (ranked first) is related to the project’s time, cost, and quality criterion. This means that the contractor can achieve the main goals of the project (delivering the project on time, the satisfactory budget, and exceeds the quality standard).

5.2.4. Adequacy of performance measurement techniques

Evaluation of existing performance measurement techniques by different parties involved in the execution of construction projects in Iraq was carried out. The results are shown in Table 3:

As predicted, the majority (78%) of the participant’s replies concerning the current techniques in actual use for measuring the performance of construction projects at the implementation phase are inefficient. In specific, about 82% of the clients and consultants agreed that the techniques are not adequate, while about 71% of the contractors admitted that inefficient techniques are in use in the Iraqi construction projects for performance measurement. This industry is in desperate need of a more practical system for performance measurement to be adopted at all phases of the project and in the implementation phase in particular.

5.2.5. Performance indicators

The gross mean results and ranking of the suggested 20 factors that can be selected as a framework to command the projects at their different life cycle phases are presented in Table 4. The Relative Importance Index (RII) for the different groups of participants and the overall RII for each indicator was calculated based on equation 3:

\[
\text{Important Index} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + n_1}{5(n_1 + n_2 + n_3 + n_4 + n_5)} \times 100\%
\]  

where

| Assessment performance measurement techniques in use | Organization type | Total \( N = 97 \) | Overall % |
|-----------------------------------------------------|------------------|----------------|------------|
|                                                     | Client \( N = 32 \) | Consultant \( N = 30 \) | Contractor \( N = 35 \) | |
| Efficient techniques adopted                        | 5                | 6              | 10         | 21         | 22         |
| Inefficient techniques adopted                      | 27               | 24             | 25         | 76         | 78         |
Table 4. Analysis of performance indicators

| Performance indicators                                      | Public sector $N = 32$ | Consultant $N = 30$ | Contractor $N = 35$ | Overall $N = 97$ |
|------------------------------------------------------------|-------------------------|---------------------|---------------------|------------------|
| The satisfaction of the client on project                   | RII 4.32 Rank 1         | RII 4.27 Rank 1     | RII 4.16 Rank 2     | RII 4.25 Rank 1  |
| The profitability of the project                            | RII 4.11 Rank 3         | RII 4.15 Rank 2     | RII 4.29 Rank 1     | RII 4.18 Rank 2  |
| Viability and feasibility of the project                   | RII 4.19 Rank 2         | RII 4.12 Rank 3     | RII 4.08 Rank 4     | RII 4.13 Rank 3  |
| The satisfaction of the users of the project                | RII 4.09 Rank 5         | RII 4.11 Rank 4     | RII 4.12 Rank 3     | RII 4.11 Rank 4  |
| Quality of the project                                     | RII 4.10 Rank 4         | RII 4.01 Rank 6     | RII 4.06 Rank 5     | RII 4.06 Rank 5  |
| Cost of the project compare with budget (cost overrun)     | RII 4.05 Rank 7         | RII 4.03 Rank 5     | RII 3.91 Rank 7     | RII 3.99 Rank 6  |
| Time of the project compare with the program (time overrun)| RII 4.06 Rank 6         | RII 3.97 Rank 7     | RII 3.92 Rank 6     | RII 3.98 Rank 7  |
| Project's productivity                                     | RII 3.92 Rank 8         | RII 3.82 Rank 8     | RII 3.89 Rank 8     | RII 3.88 Rank 8  |
| Project's brief—clear and summarized                       | RII 3.75 Rank 10        | RII 3.78 Rank 9     | RII 3.76 Rank 9     | RII 3.76 Rank 9  |
| Lead time agreed                                           | RII 3.68 Rank 11        | RII 3.71 Rank 10    | RII 3.69 Rank 10    | RII 3.69 Rank 10 |
| Amount of defects                                          | RII 3.76 Rank 9         | RII 3.70 Rank 11    | RII 3.60 Rank 12    | RII 3.65 Rank 11 |
| Performance indicators                              | Public sector  | Consultant  | Contractor | Overall  |
|---------------------------------------------------|----------------|-------------|------------|----------|
|                                                   | RII | Rank | RII | Rank | RII | Rank | %  | RII |
| Achieving the objectives of the project           | 3.65 | 12   | 3.57 | 14   | 3.62 | 11   | 3.61 | 12   |
| Safety and number of accidents                    | 3.62 | 13   | 3.59 | 12   | 3.57 | 13   | 3.59 | 13   |
| Amount of claims                                  | 3.50 | 15   | 3.58 | 13   | 3.51 | 14   | 3.53 | 14   |
| Approval of authorities concerned efficiency      | 3.57 | 14   | 3.51 | 15   | 3.42 | 15   | 3.50 | 15   |
| Philosophy of top management                      | 3.35 | 16   | 3.37 | 16   | 3.24 | 16   | 3.32 | 16   |
| Effect of environment                             | 3.26 | 17   | 3.27 | 17   | 3.15 | 17   | 3.22 | 17   |
| Growth and learning                               | 3.20 | 18   | 3.19 | 18   | 3.11 | 18   | 3.16 | 18   |
| Social commitment                                 | 3.11 | 19   | 3.07 | 19   | 2.87 | 20   | 3.01 | 19   |
| Innovation                                        | 3.02 | 20   | 3.01 | 20   | 2.88 | 19   | 2.96 | 20   |

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| Performance indicators | Overall RII | Rank | % Above average | % Below average | Degree of significance |
|------------------------|------------|------|-----------------|----------------|-----------------------|
| The satisfaction of the client on project | 4.25 | 1 | 15.49 |  | Very significant |
| The profitability of the project | 4.18 | 2 | 13.59 |  | Very significant |
| Viability and feasibility of the project | 4.13 | 3 | 12.23 |  | Very significant |
| The satisfaction of the users of the project | 4.11 | 4 | 11.68 |  | Very significant |
| Quality of the project | 4.06 | 5 | 10.33 |  | Very significant |
| Cost of the project compare with budget (cost overrun) | 3.99 | 6 | 8.42 |  | Significant |
| Time of the project compare with program (time overrun) | 3.98 | 7 | 8.15 |  | Significant |
| Project’s productivity | 3.88 | 8 | 5.43 |  | Significant |
| Project’s brief—clear and summarized | 3.76 | 9 | 2.17 |  | Significant |
| Lead time agreed | 3.69 | 10 | 0.27 |  | Significant |
| Amount of defects | 3.65 | 11 | 0.82 |  |  |
| Achieving the objectives of the project | 3.61 | 12 | −1.90 |  |  |
| Safety and number of accidents | 3.59 | 13 | −2.45 |  |  |
| Amount of claims | 3.53 | 14 | −4.07 |  |  |
| Approval of authorities concerned efficiency | 3.50 | 15 | −4.89 |  |  |
| Philosophy of top management | 3.32 | 16 | −9.78 |  |  |
| Effect of environment | 3.22 | 17 | −12.50 |  |  |
| Growth and learning | 3.16 | 18 | −14.13 |  |  |
| Social commitment | 3.01 | 19 | −18.21 |  |  |
| Innovation | 2.96 | 20 | −19.56 |  |  |
A number of respondents who answered the influence: n1 very low, n2 low, n3 average, n4 high, and n5 very high.

The average RII based on the overall results was 3.68. Table 5 represents the percentages above or below the average RII and the degree of significance is assumed that the factors with overall mean more than 10% of the average for all factors are “very significant”, factors with overall mean between 0% and 9.99% above the average for all factors are “significant”, while factors with overall mean less than the average mean of all factors are “non-significant”.

6. Conclusions
The aim of the current study was an attempt to evaluate the systems in use for performance measurement adopted through the implementation phase of construction projects in Iraq. This aim was achieved through literature review, interviews and questionnaires received from 32 clients (Government departments and private developers), 30 consultants, and 35 contractors, subcontractors, and suppliers.

This study reveals tentative findings concerning the construction project’s performance measurement in Iraq.

The most important findings revealed from the analysis of the survey are the following:

• The average mean for all 20 performance indicators included in the study was 3.68.
• The “very significant” factors are satisfaction of the client on the project, profitability of the project, viability, and feasibility of the project, satisfaction of the users of the project, and quality of the project.
• The “significant” factors are cost of the project compare with budget (cost overrun), time of the project compare with a program (time overrun), project’s productivity, project’s brief—clear and summarized, and lead-time agreed.
• The rest of the factors mentioned in Table 4 with the overall average mean less than 3.68 are considered “non-significant” factors (the factors ranked 11–20 on overall ranking).
• All the respondents participated in the survey agreed that the most significant factors among the 20 factors are satisfaction of the client on the project, the profitability of the project, viability, and feasibility of the project, and satisfaction of the users of the project.
• All the participants agreed that the five factors (philosophy of top management, the effect of environment, growth and learning, social commitment, and innovation) are the least important factors among the 20 factors included in the questionnaire.
• For factors ranked 5th to 14th (based on overall mean), there is little difference in the opinion of the respondents from different categories.
• Further analysis using Kruskal–Wallis one-Way ANOVA test for a k independent sample confirmed that none out of 20 variables exhibited statistically significant differences in opinions at the 1% and 5% significance levels. As a result, the null hypothesis stating that ‘the indicators used to measure project performance in the implementation phase of project lifecycle do not vary based on the perceptions of the different project stakeholders (Government, private clients, consultants, and contractors) in Iraq’ could not be accepted.

7. Discussions
The key to the performance measurement of a project’s success is the efficient management of the construction process. According to the findings introduced, the performance of construction projects in Iraq could be measured by the 20 factors, combining the nonfinancial and financial measures. The particular organization or project will locate the relative significance of the mentioned factors and its performance dimensions and how its relative significance changes by time as mentioned by Maloney (1990).
In Iraq, no clearly defined model looks to be implemented for the measurement of performance at the different stages of the project in general and implementation stage in specific. Although there are some trials to introduce more than one model by the large construction companies, these models have not been efficiently implemented any of these companies. The interviews conducted concurrently with the survey recommended some of the participants did not exercise any model for the performance measurement, while some have a reasonable amount of experience concerning this subject. This may be because no enforcement by the Iraqi government to adopt any specific system. This is correct, according to Luu et al. (2008) in many developing countries.

The 20 factors selected by the Iraqi professional stakeholders could shape a system for construction projects to measure their performance at the implementation and completion phase of the construction project.

Finally, the construction industry in Iraq is in desperate need of a more practical system for performance measurement to be adopted at all phases of the project and in the implementation phase in particular.

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