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Research paper



Identify the Appropriate Key Performance Indicators for Evaluating the Performance of Construction Companies in Iraq

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Abstract

After 2003, Iraqi market has been opened in front of the world. Many of international companies have entered to the Iraqi construction market. This has led to high competition between construction companies, especially the governmental companies under the Ministry of Construction and Housing. Competition has put a strong pressure on the construction companies to continuously improve their performance. There has been a lot of research for measuring performance at the project's level, but there is a clear lack of research on the performance measurement at the companies' level. The current method of performance evaluation is relying solely on financial indicators, which cannot be the only factor for evaluating performance. Other indicators such as customer's satisfaction, work efficiency, effective planning, etc. have become of great importance to the company success. The research aims are to identify the appropriate set of key performance indicators to measure the performance of construction companies in Iraq. A questionnaire forms have been distributed which includes main performance indicators that derived from the previous studies which affect the construction companies. in conclusion, 10 KPIs selected for the construction companies that can be the start point to make a comprehensive framework for the construction companies in Iraq.

Keywords: *Balanced Scorecards (BSC), Company Objectives, Company Success, Key Performance Indictors (KPIs), Performance Measurement.*

1. Introduction

High competitiveness and profound changes in the construction industry forces executives to improve their company performance continually [1]. The measurement of performance is the essence of continuous improvement. The applications of the measurement process within the companies can be identify the strengths and weaknesses in performance. Thus, the adoption of points that lead to the increase and development of performance and avoid the aspects that lead to poor performance and this, in turn, leads to the excellence of the company regarding the performance [2]. The construction companies seek to obtain an integrated picture of their performance by relying on indicators and measures of performance.

In the context of the challenges that are facing contemporary companies in multiple forms for continuous improvement in performance, the importance of key performance indicators (KPIs) has emerged. In order to measure performance, it is necessary to select the appropriate key performance indicators, which plays a vital role in providing the management with information about the performance of the company. Performance indicators are based on the integration of financial and non-financial performance of the company. There are many studies and researches to determine the key performance indicators, but most of them focus on performance measurement at the project level. While, there are a limited number of studies to measure performance at the company level [1]. KPIs are measuring indicators that can be used by organizations in order to assess their performance. In other words, KPIs help organizations to determine the extent of their success in achieving their objectives [3].

A review of scientific studies in this field has been showed that there are few attempts to identify the indicators that can be used to measure the performance of construction companies in Iraq. Most of the existing research focused on the measurement of the performance using financial indicators only, which do not really reflect the performance of the company. This because of the success of the company and its ability to survive and competition is not dependent on the financial indicators only. Therefore the purpose of this paper is to determine the key performance indicators appropriate to measure the performance of construction companies in Iraq.

2. Literature review

The literature review will include several sub-sections, namely performance measurement, performance indicators classification, and balanced scorecards which relate to this research.

2.1. Performance measurement

The difference in the concept of performance stems from the different measures and criteria that are adopted in the performance measurement, which are used by managers and companies. Despite this difference, most researchers express performance through the success achieved by the company in achieving its objectives.

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Performance measurement is the process that determines the success of an organization in achieving its objectives [2]. In this way, when implementing a performance measurement system in a company, the basic information required for a performance management process is obtained [2].
Navon 2005, has been defined the performance measurement as a comparison between the actual performance, and the required or planned performance [4]. Also, Neely 2002, has defined the performance measurement as the process of measuring the efficiency and effectiveness of an action [5].
Any action requiring to management or control also implies knowledge of the state of the action. That is, whether or not it is as originally planned, so that we can act accordingly. Therefore, it is legitimate to assume that since the management concept exists, performance analysis is an integral part of this concept [6].
Performance measurement is not an option that contributes to the process of improvement, and we use it if the budget is available. Therefore, it is the essential step for any improvement process if we want to achieve tangible results continuously by achieving the required quality at the lowest costs for the customer and the highest profit value of the company [7].

2.2. Performance indicators classification

Previously, financial measures have been used to measure and evaluate the performance. The main problem lies in the fact that the financial indicators are lagging indicators in the sense that they give the results of activities completed in advance. However, managers often need current, non-financial information to be able to make better decisions [1].
An effective performance management system relies heavily on the performance measures used to determine the performance of the organization from several perspectives. It is therefore essential to design these measures so that they are directly related to the multiple views that the organization decides to adopt. The subject of design performance measures has become the subject of research for a while in the 1990s, where some interest in emerging techniques such as total quality management, and comparative measurement, which shifted the focus from lagging indicators to the leading indicators [2].
These measures should be objective, easy to understand, controllable by minimizing external influences, timely, accurate, cost-effective, useful, motivating, and traceable.
Performance indicators are categorized into [7]:
Lagging indicators: These indicators that measure the performance after it occurs, which shows the final result of the work after it has been completed. For example, profitability is a lagging indicator, and it seems that when moving to improve performance, lagging indicators are highly questionable because the information it provides always comes late and does not allow the adjustments and improvements to what is being done.
Leading Indicators: These indicators can predict more about future performance. Leading indicators are usually measured more frequently than lagging indicators.
After a long adoption of financial measures, several studies have been undertaken to develop a performance measurement framework that includes financial and non-financial measures.

2.3. Balanced scorecards

The creators of the balanced scorecards (BSC), Kaplan and Norton, began their studies on the subject in the 80s, and published it in their article: "The BSC" of the Harvard Business Review (1992), where they define the BSC as: "A set of indicators that provide top management with a comprehensive view of the business." Over time, and to the extent that the BSC is imposed on more organizations, it has become a comprehensive management system articulated with strategic planning [8].
Kaplan and Norton (1996, 2000, 2001, 2009) affirm that the BSC: provides managers with the necessary tools to navigate towards competitive success. In modern complex environments; translates the strategy and mission of the organization into a broad set of action measures, which provide the necessary framework for a strategic measurement and management system. It is the essential element of the information system that supports the management control system in its mission to improve its level of competitiveness in the long term; it allows them to keep track on financial results in parallel with the training of skills and the acquisition of the intangible assets they need for future growth. The performance of the organization is measured from four balanced perspectives: finance, customers, internal processes, and learning and growth (Figure 1) [9][10][11][12].

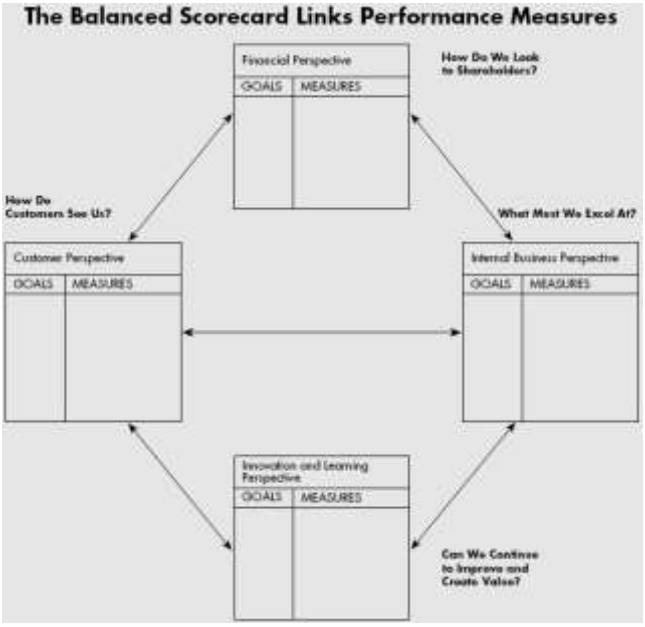


Figure 1: The four perspectives of the balanced scorecards [8]

Furthermore, the authors unequivocally notice that all these four perspectives are linked, and appropriate consideration must be given to all these perspectives to gain success of the organization. BSC is essential in trying to balance financial and non-financial performance measures to assess short-term and long-term performance in a consolidated report. Thus, BSC reduces managers' focus on short-term financial performance such as annual or quarterly gains, but it is concerned with strong improvements in nonfinancial measures that suggest the possibility of creating future economic value.

3. Methodology

3.1. Selection of key performance indicators (KPIs)

In this paper, the main sections of the performance indicators of construction companies have been determined based on the four perspectives of balanced scorecards framework, in addition to the fifth perspective, the social and environmental perspective. Where the following five perspectives are adopted in the study:

1. Financial Perspective
2. Customer perspective
3. Internal business perspective
4. Learning and growth perspective
5. Social and environmental perspective

An extensive study of previous research and interviews with experts in the construction companies in Iraq were carried out to find the initial key performance indicators set within each perspective. 58 key performance indicators were identified, divided by 10 for the financial perspective, 8 for the customer perspective, 24 for the internal business perspective, 7 for the learning and growth perspective, and 9 for the social and environmental perspective.

3.2. Questionnaire design

To identify the relative importance of the performance indicators for the construction contracting companies in Iraq, the authors designed a questionnaire form to collect the data from eight public construction companies (Table 1) related to the Ministry of Construction, Housing, and Municipalities in Iraq. The questionnaire obtained reliability using Guttman Split-Half Reliability coefficient with 0.97 value, and this means high stability of the questionnaire. The coefficient calculated using the SPSS software.

Table 1: The companies involved in the questionnaire

#	Company	Distributed questionnaires	Received questionnaires
1	Al-Mansour General Company for Constructional Contracts	11	11
2	Hammurabi General Company for Constructional Contracts	11	11
3	Al-Rasheed General Company for Constructional Contracts	11	11
4	Al-Farouq General Company for Constructional Contracts	11	11
5	Ashur General Company for Constructional Contracts	11	10
6	Saad General Company for Constructional Contracts	11	9
7	Al-FAO General Engineering Company	11	10
8	AL-Mutasim General Company for Constructional Contracts	11	8
Total number of questionnaires		88	81

4. Data analysis

4.1. Relative importance

To compute the relative importance we use the Equation (1) below, which it computes the weighing mean score for each KPI as it is the best way to measure central tendency for ordinal data:

$$\text{Mean Score } \bar{X} = \frac{\sum_{i=1}^{n} f_i X_i}{\sum_{i=1}^{n} f_i} \quad (1)$$

Where

X_i: *The score (1-5)*
f_i: *The frequency of i_{th} answers*
n: *The number of score values and due to using the five-point scale then n=5.*

The result will take a value from the range (1 to 5) due to the use of a five-point Likert scale. Where the measure was: 1) Not important, 2) Slightly important, 3) Moderately important, 4) Important, and 5) Very important.

After that, we will calculate relative importance as a percentage by divide the mean score on the highest score, i.e., 5 and multiply the result by 100.

4.2. The participants and companies characteristics

A total of 88 questionnaires have been distributed to experienced engineers and many departments' heads in the eight companies. The forms returned were 81 as pointed in Table 1, so the number of questionnaires analyzed were 81 which represent 92% of the questionnaires which had distributed. The sample has selected based on the relation of the participants to the performance measurement and the experience of them in the company. The specialty of participants were 81% civil engineers, 6% Architects, 5% mechanical engineers, 3% electrical engineers, 1% surveying engineers, and 1% sanitary engineers. All the companies have more than 300 employees, and that refers to the size of these companies. Nine percent of the participants have experience with construction companies less than ten years, 49% for 10-20 years, 31% for 20-30 years, and 11% for more than 30 years. The result confirms that most participants (91%) have more than ten years of experience.

5. Results

The data that have been collected from the questionnaire analyzed statistically using the MS Excel spreadsheets and SPSS software. The mean score, standard deviation, and relative importance for each KPI ranked in descending order in Table 2.

Table 2 has showed that the profitability is the most important indicator for most companies with relative importance equal to 93.1%, followed by quality of service and work with 89.4% importance. This confirm the importance of non-financial indicators for the success of the company as there are seven non-financial indicators in the first ten indicators.

6. Results discussion

Kaplan & Norton 1992, have been mentioned that the number of KPIs is 15-20 for the company [8], while Swan & Kyng 2004, stated that the suitable amount of KPIs is 8-12 [13]; also Yu et al. 2007, identified 16 KPIs from 26 KPIs to apply it on construction companies [14]. Alarcón et al. 2001, said that the implementation of a performance measurement system (PMS) should begin with relatively few KPIs [15], while Costa et al. 2004, have mentioned that high number of KPIs prevents the smooth application of PMS [16].

Table 2: Relative importance of the key performance indicators

#	KPI	perspective	Mean Score	Standard Deviation	Relative Importance
1	Profitability	1	4.65	0.655	93.1%
2	Quality of service and work	2	4.47	0.709	89.4%
3	Business efficiency	3	4.41	0.848	88.1%
4	Effectiveness of planning	3	4.40	0.785	87.9%
5	Financial stability	1	4.26	0.755	85.2%
6	Cash flow	1	4.26	0.803	85.2%
7	Safety	3	4.23	0.912	84.7%
8	Organization competency in management human resources	4	4.22	0.894	84.4%
9	External customer satisfaction	2	4.20	0.941	84.0%
10	On-time delivery	3	4.19	1.026	83.7%
11	Meet predetermined goals	3	4.14	0.945	82.7%
12	Meet technical specifications	3	4.12	0.872	82.5%
13	Managers competency	3	4.07	0.891	81.5%
14	company's reputation	4	4.05	0.740	81.0%
15	Motivation	4	4.04	0.872	80.7%
16	Continuous improvement	4	4.04	0.843	80.7%
17	Quality control and rework	3	4.02	1.000	80.5%
18	Policy or law of government	5	4.02	0.851	80.5%
19	Competitive price	2	4.02	0.935	80.5%
20	Risk control	5	4.01	0.859	80.2%
21	Market share	2	4.01	0.698	80.2%
22	Completion within Budget	1	4.01	1.090	80.2%

23	Capital	1	4.00	0.987	80.0%
24	Human resource training and development	4	4.00	0.822	80.0%
25	Internal customer satisfaction	2	4.00	0.949	80.0%
26	Competitors	5	4.00	0.707	80.0%
27	Labor efficiency	3	3.96	0.749	79.3%
28	Number of high-performance professionals	3	3.95	1.023	79.0%
29	Growth	1	3.95	0.820	79.0%
30	Meet the requirements	3	3.93	0.985	78.5%
31	Project feasibility	3	3.90	0.889	78.0%
32	Value of money	2	3.89	1.012	77.8%
33	Cost Control Mechanism	1	3.88	1.041	77.5%
34	Organizational structure	3	3.86	0.833	77.3%
35	Productivity	3	3.85	0.853	77.0%
36	Resource management	3	3.80	0.900	76.0%
37	Hassle-free relationship	2	3.80	0.980	76.0%
38	Claims	3	3.77	0.898	75.3%
39	Reliability of financial performance	1	3.73	0.988	74.6%
40	Successful tenders rate	3	3.70	0.813	74.1%
41	Flexibility for future expansion	4	3.65	0.964	73.1%
42	Defects	3	3.64	0.979	72.8%
43	Technological capability	3	3.62	1.079	72.3%
44	Partnership and suppliers	5	3.58	1.011	71.6%
45	Research and development	3	3.58	0.998	71.6%
46	Energy use	5	3.54	1.130	70.9%
47	Informatization	4	3.53	0.950	70.6%
48	Impact on society	5	3.51	1.050	70.1%
49	Innovation	3	3.51	1.108	70.1%
50	Number of new customers	2	3.49	0.963	69.9%
51	Interest cover	1	3.44	1.049	68.9%
52	Disputes	3	3.43	0.907	68.6%
53	Main water use	5	3.41	1.149	68.1%
54	Contractual arrangement	3	3.37	0.914	67.4%
55	Investment in development of new markets	1	3.35	1.153	66.9%
56	Staff turnover	3	3.33	1.025	66.7%
57	Waste	5	3.21	1.126	64.2%
58	Impact on biodiversity	5	3.02	1.107	60.5%

Perspective code: 1= Financial, 2= Customer, 3= Internal business, 4= Learning and growth, 5= Social and environment

It has been also note the variation in the relative importance of these indicators, and since the companies cannot make overall improvements and the use and control of all indicators, so we have chosen ten performance indicators depending on the sequence of importance.

The results showed that it is not possible to rely only on a specific aspect of the performance evaluation of construction companies. The results also proved the lack of financial indicators in expressing the performance or success of the company. The results showed that the indicators selected are divided into four perspectives: financial, customer, internal business, and learning and growth.

The results showed that the top ten indicators included three financial indicators, two customer indicators, four internal business indicators, and one learning and growth indicator.

These indicators affect each other, improving the Organization competency in human resource management within a learning and growth perspective, this will result in improved business efficiency, the effectiveness of planning, safety and on-time delivery indicators within the internal business perspective. In turn, this will lead to an increase in the quality of service provided and customer satisfaction and thus will improve the financial indicators by increasing profitability, financial stability, and cash flow.

Companies now aspire to develop human resources to build the necessary skills that enable employees to perform the tasks entrusted to them in the best way. Human resources can contribute significantly to achieving the goals and success of the company.

The external customer satisfaction indicator also is important in measuring the performance of the company. Construction companies are undoubtedly dependent on their customers and should meet their needs because customer satisfaction is essential to the success and sustainability of the company.

To use the selected indicators, we need to know how to measure it. From the studies reviewed, many measures developed to measure the indicators. Table 3 shows the methods of measuring the indicators selected.

#	Indicator	Measurement method
1	Profitability [1]	○ Profitability=$\frac{\text{Profit before tax and interest}}{\text{Total revenues}}$ ○ Net Income=Total revenues-all expenses ○ Economic Value Added (EVA) = Net operating profit after taxes – money cost of capital
2	Financial stability [14]	○ Debt ratio=$\frac{\text{Total debt}}{\text{Total assets}}$
3	Cash flow [1]	○ Cash flow=$\frac{\text{Cash flow from operations}}{\text{Current liabilities}}$ ○ Cash flow=$\frac{\text{Cash flow from operations}}{\text{Net income}}$
4	Quality of service and work [17]	○ Rework factor=$\frac{\text{Total Direct cost of Field Rework}}{\text{Actual construction phase cost}}$
5	External customer satisfaction [18]	○ Customer Satisfaction Survey
6	Business efficiency [1]	○ efficiency ratio=$\frac{\text{Expenses}}{\text{Revenues}}$
7	Effectiveness of planning [18]	○ Change cost factor=$\frac{\text{Total cost of changes in works}}{\text{Actual total cost of works}}$
8	Safety [1]	○ Safety performance=$\frac{\text{Number of reportable accidents}}{\text{Average number employed}}$ ○ Incidents rate=$\frac{\text{Number of recordable incidents*200,000}}{\text{Total site work hours}}$
9	On-time delivery [19]	○ Delivery ratio=$\frac{\text{Number of projects delivered on time}}{\text{Total number of projects}}$
10	Organization competency in management human resources [20] [21]	○ return on training investment=$\frac{\text{Profit}}{\text{training costs}}$*100 ○ Training ratio =No. of trainees/total number of staff

7. Conclusion

Performance measurement is an essential feature to improve the performance. The main objective of this study is to identify the

most important indicators for measuring the performance of construction companies in Iraq.

In this research, 58 performance indicators have been proposed according to the four BSC perspectives, in addition to a fifth perspective, the social and environmental perspective. After reviewing the studies and literature, and studying the current reality of construction companies, a questionnaire has designed to obtain data from eight construction companies, to identify the KPIs appropriate to the construction companies in Iraq accurately. The analysis of the responses gives the relative importance for each KPI. Ten indicators have been selected as the most critical KPIs to improve the construction companies' performance which are profitability, financial stability, cash flow, quality of service and work, external customer satisfaction, business efficiency, the effectiveness of planning, safety, on-time delivery, and organization competency in human resources management. These indicators resulted from the analytical study we conducted in this research, can be used as the basis of a model or a system for measuring performance in the construction companies. These KPIs can be considered as a starting point for the future researches to make a comprehensive framework for construction companies in Iraq or for the Iraqi construction industry in general.

8. Recommendations

Conduct further studies and research to achieve a better understanding of the key performance indicators and the use of these indicators. Further studies on the methods and approaches of measuring these indicators in order to standardize these methods, and to develop a model of measurement based on the identified indicators to compare the performance of construction companies in Iraq.

Holding training courses for the employees in the construction companies to spread a culture of evaluation of performance and performance measurement methods, including the key performance indicators.

A collaborative effort among construction companies in Iraq to develop benchmark indicators for the construction industry.

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