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# FRAMEWORK OF PERFORMANCE MEASUREMENT PRACTICES IN CONSTRUCTION COMPANIES IN EGYPT

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## ABSTRACT

Construction industry is considered as one of the most important sectors in Egypt. One of the major challenges faced by the industry, however, is the unavailability of suitable performance measurement systems for assessing companies' performance. Modern performance assessment systems adopt a more universal approach to the measurement of construction company performance as opposed to the traditional project triangle. This paper aims to examine the practice of performance measurement in the Egyptian construction industry. Results show dominant role of in-house developed performance management systems as well as the use of KPIs as a method of performance assessment. The study further reveals that the highest importance is given to measures related to the time of project delivery, quality of works, clients' satisfaction and profitability. Hence, the traditional project triangle of project's success is the most prevalent approach to performance evaluation in the construction industry in Egypt. However, a shift towards a more holistic approach to performance assessment in larger companies was observed.

## KEY WORDS

performance, measurement systems, construction, industry, Egypt

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## INTRODUCTION

Construction companies contribute significantly to the provision of new job opportunities and domestic investment. Therefore, the construction industry is considered as one of the crucial industries in the Egyptian economy behind the agriculture and oil industry (Bank Audi, 2016). Egyptian Centre for Economic Studies (ECES) estimates that Egyptian

construction industry (ECI) has employed about 2.7 millions Egyptians between 2009–2014 (approx. 11% of national workforce) (Oxford Business Group, 2017). Similarly, the Central Bank of Egypt (CBoE) estimated that the construction industry's share of the country's GDP was about 4.8% in 2015 (Bank Audi, 2016). It is believed that Egypt is encountering a new development era in the construction

sector. The value of the current construction projects agenda is estimated to be around £200 billion. Future plans include the development of one million affordable houses at an estimated cost of about £30 billion as well as the expansion of the Cairo metro line (Oxford Business Group, 2017).

The construction sector in general is considered as one of the among the most inefficient and ineffective sectors (Beatham et al., 2004) mainly due to poor workmanship, materials unavailability, project changes during execution, lack of project information, equipment unavailability and faulty works (Vaverde-Gascueña et al., 2011). Therefore, the construction industry's main concern is to enhance performance by improving the project delivery process. That has resulted in the inclusion of quality and performance management in the management systems of construction companies. In the last decade, the construction industry has started to implement integrated performance measurement systems (PMS) and develop a new approach to maximise companies' performance (Vukomanovic et al., 2007). This paper aims to identify the elements of these performance measurement systems that are being used by Egyptian construction companies.

## 1. LITERATURE REVIEW

Performance measurement has been widely discussed by several researchers, but only a few of them have tried to define the term. Neely et al. (1999) described performance measurement as: "the process of quantifying the efficiency and effectiveness of actions". Where the effectiveness is defined as "the extent to which customer requirements are met and efficiency is a measure of how economically the firm's resources are utilized when providing a given level of customer satisfaction". Traditionally, organisation's performance was assessed on the basis of its financial performance. In the 80s and early 90s, many organisations and industries began to criticise the use of financial measures to evaluate organisational performance and have started to work towards implementing other aspects of performance including quality considerations (Vukomanovic & Radujković, 2007). Generally, performance measurement was associated with quality management as a natural component of evaluation, analysis and control (Abd Elhamid & Ghareeb, 2011). Sharif (2002) argued that the perception and role of performance

measurement have changed with the need to answer different organisation's objectives. He argued that answers to simple questions, e.g. "How are we performing?", "What is our cash flow?", "What do our customers think of us?", provide the organisation with business-critical information. However, this leads to evaluating performance following the vague concept of business performance. Sharif (2002) claims that performance cannot be considered in isolation. It is a multidimensional phenomenon, and the process should be subjected to further perspectives to form a complete evaluation of the actual performance. That has justified the introduction of performance measurement systems (PMS). Traditionally, the construction industry maintained to measure its performance from a financial perspective only, neglecting any other influencers of their financial position (Ahmad et al., 2016). However, the performance measurement has started to change with the introduction of one of the project management's leading principles by Martin Barnes. It was the so-called "project's iron triangle" of cost, time and quality performance (Weaver, 2007). This has triggered the development of new performance measurement models which have considered project performance and project-based organisations performance in a broader sense. Those models were based on multidimensional principles.

For decades, the construction industry has been identified as one of the most ineffective and inefficient industries (Latham, 1994; Egan, 1998; Beatham et al., 2004; Tennant & Langford, 2008). Consequently, in 2003, construction companies decided to tackle performance issues by investing around £1.5 billion GBP in performance measurement tools (Vukomanović et al., 2010). In response to the Latham (1994) and Egan (1998) reports, the UK's construction industry created "the single organisation charged with driving the change agenda in construction". The Construction Best Practice Programme (CBPP), thus, emerged in the UK in 1998. Following a series of mergers, the Constructing Excellence was formed in 2003, to create "...a powerful, influential voice for improvement in the built environment sector". CBPP has initiated the first list of 10 Key Performance Indicators (KPIs) to measure performance in the construction industry (Tennant & Langford, 2008). The Construction Excellence (2016) defined Key Performance Indicator (KPI) as "the measure of an activity performance that is critical to the success of an organisation". The following KPIs are predominantly used in performance measurement systems of UK's construction companies:

- client satisfaction – product,

- client satisfaction – service,
- cost predictability (project, design, construction),
- time predictability (project, design, construction),
- defects,
- construction cost,
- construction time,
- profitability,
- productivity,
- safety.

However, Beatham et al. (2004) criticised KPIs. They argue that KPIs could be only applied as a performance measurement tool within a Project Management system. Nudurupati et al. (2007) add that KPIs can be classified as lagging indicators as they measure the actions after their occurrence, so they do not offer an opportunity to change what has already happened, leading to the inability to predict future improvements. Building on the literature review, the authors aim to uncover performance measurement practice and the structure of Performance Measurement Systems in the Egyptian construction industry. Considering certain peculiarities of the construction industry in Egypt, a structure of PMS has been proposed (Fig. 1).

## 2. RESEARCH METHODS

A survey of construction professionals was adopted, targeting construction companies located in the upper region of Egypt. Questionnaires were distributed to 250 companies operating in the Greater Cairo region, Alexandria and Zagazig. A total of 98 responses were subsequently received. Respondent characteristics are shown in Tab. 1.

Most of the surveyed companies were engaged in construction projects (56%) delivering up 20 projects in the last three years (79%). The sample was equally

distributed in terms of company size, average project duration and project value. The respondents were involved mainly in general planning and quantity surveying aspects of their construction projects (43%), with almost 1/3 holding senior management positions.

Respondents were asked to rank the proposed PMS measures as specified in Fig. 1. The rank 1 represented the most important measure of performance, while 7 represented the least important. To present the results, the correspondence analysis was adopted. The correspondence analysis is explorative statistical technique, for representing the relationship and associations between the elements of data sets (Greenacre & Hastie, 1987). The output of correspondence analysis is a graphical representation of the relationships between data categories by plotting them as points in two, three dimensional space. The closer the proximity of a pair of points, the stronger relationship between them. To establish the relative importance of proposed performance measures, the Relative Importance Index (RII) was computed (Eq. 1).

$$RII = \frac{\sum_{i=1}^N W_i}{A * N} \quad (1)$$

where:

$W$  — the weight given to each element by the respondents and ranges from 1 to 7, (where “1” is given to element ranked as the seventh and “7” if the element was ranked as first),

$A$  — the highest weight (i.e. 7 in this case),

$N$  — the total number of respondents.

## 3. RESEARCH RESULTS

The use of established performance measurement systems is rather low in the Egyptian construction industry (Fig. 2). The majority of surveyed

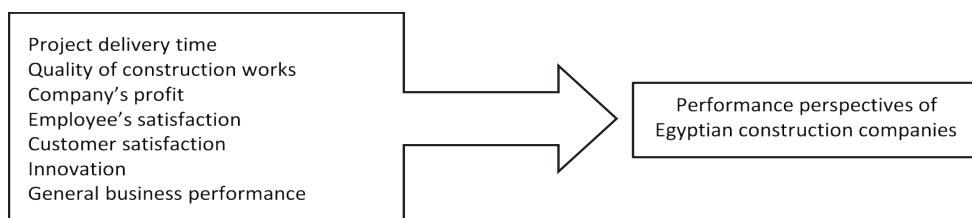


Fig. 1. Research framework for performance measurement in the Egyptian construction industry

Tab. 1. Respondent characteristics

COMPANY SIZE	[%]	ROLE IN PROJECT	[%]
Micro	13	General/construction director	32
Small	27	Project managers	25
Medium	23	Planners and Quantity Surveyors	43
Large	37		
NATURE OF PROJECTS	[%]	NO OF PROJECTS DELIVERED IN THE LAST 3 YEARS	[%]
Construction	56	Less than 10	43
Repair/Refurbishment	29	10 to 20	36
Civil Engineering & Infrastructure	15	20 to 50	18
		more than 50	3
AVERAGE PROJECT DURATION	[%]	AVERAGE PROJECT VALUE*, <sup>a</sup>	[%]
Under 6 months	12	<1 mln EGP	12
From 6 to 12 months	27	1 to 5 mln EGP	21
From 13 to 18 months	26	5 to 10 mln EGP	20
From 19 to 24 months	15	10 to 25 mln EGP	15
More than 24 months	20	25 to 50 mln EGP	18
		50 to 100 mln EGP	16
		>100 mln EGP	29
		Don't know	6

Note: \*1GBP = 24.67 EGP, <sup>a</sup> – more than one answer was possible.

companies of all size ranges use their measurement systems.

Interestingly, a relatively high share of respondents from medium and large companies do not know how the performance is measured. It could be the effect of the lack of proper information that should have been distributed among employees. It is very unlikely that there is no performance measurement system in use at all. The majority of surveyed companies declared the use of a bespoke, in-house developed performance measurement system. To establish the nature of that system, respondents were asked to describe how the performance is measured. The results are presented in Fig. 3.

Most of the surveyed companies compare their company's performance with data of previous years. The interesting part of this finding is the fact that the data is not finance-related. The data shows that only large companies use performance measurement tools in the assessment of their performance.

To establish the most applicable elements of performance measurement in Egypt, respondents were asked to rank the importance of the system's elements. The correspondence analysis was applied to analyse the collected data. This method requires the selection of the number of dimensions that explain the variability in the dataset. The commonly used rules recommend that the chosen number of dimensions should represent more than 70% of the inertia in data (Higgs,

1991). Our analysis indicated the choice of 15 dimensions that would explain 70% of inertia. However, in that case, interpreting the results would have been almost impossible. Therefore, it was decided that two dimensions explaining 15% of inertia should be adopted. Graphical results of the correspondence analysis are shown in Fig. 4.

The distances of the points in Fig. 4 are informative. The points close together have similar patterns of responses. It appears that the low ranking of quality, time of project delivery and customer satisfaction together with high ranks given to innovation & learning and employee satisfaction have formed a homogeneous subgroup. Moreover, the distance of that subgroup from variables representing the size of investigated companies, indicate their low importance in measuring the performance of Egyptian construction companies. Therefore, the perception of a successful construction company in Egypt is closely related to its product quality, customer satisfaction and the timeliness of delivery. To further extend interpretations and to examine factors influencing the performance measure practice, a second subgroup encompassing company size has been investigated. The similarity in patterns of responses between company size and performance measures is shown in Fig. 5.

Similar patterns of responses for micro and small companies is revealed. The profitability and customer

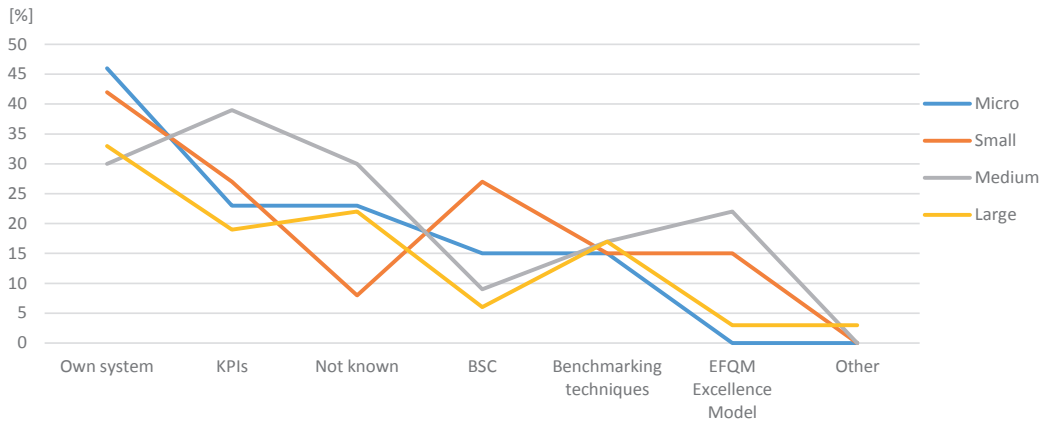


Fig. 2. Use of performance measurement systems in the Egyptian construction industry [%]

Note: BSC — Balanced Scorecard, EFQM — European Foundation Quality Management.



Fig. 3. Character of performance measurement systems in the Egyptian construction industry [%]

satisfaction, which is also expressed in terms of a project delivery time and the quality of construction works, play a key role in the performance assessment. This approach to performance measurement could be described as customer driven. This finding supports the philosophy that micro and small enterprises are often more capable of delivering to customers what is required. That is perceived as the best formula for achieving profit, which seems to be considered, as the best company’s performance measure. The position of medium and large construction companies indicates a shift towards a more holistic view of performance measures. Medium and large enterprises are somehow “torn” between the classic time–cost–quality triangle and acknowledging employee satis-

faction and general business performance measures. However, a tendency of medium-sized companies towards acknowledging profits as a measure of performance still can be observed. The profile of medium enterprises, as shown in Fig. 5, reveals that more attention in performance measurement system is given to the time of project delivery and profitability than employee satisfaction and business performance. “A look into the future” and organisational development, what could have been expressed with innovation and learning importance in performance measurement, seem to be disregarded by all surveyed companies.

The correspondence analysis has revealed the perception of respondents on the structure of

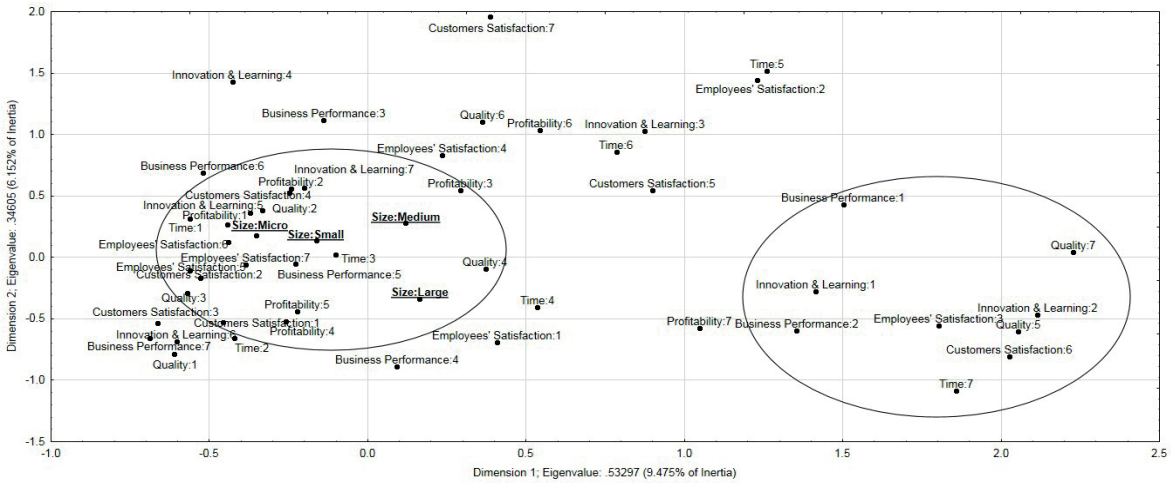


Fig. 4. Profile of performance measurement system in Egyptian construction industry

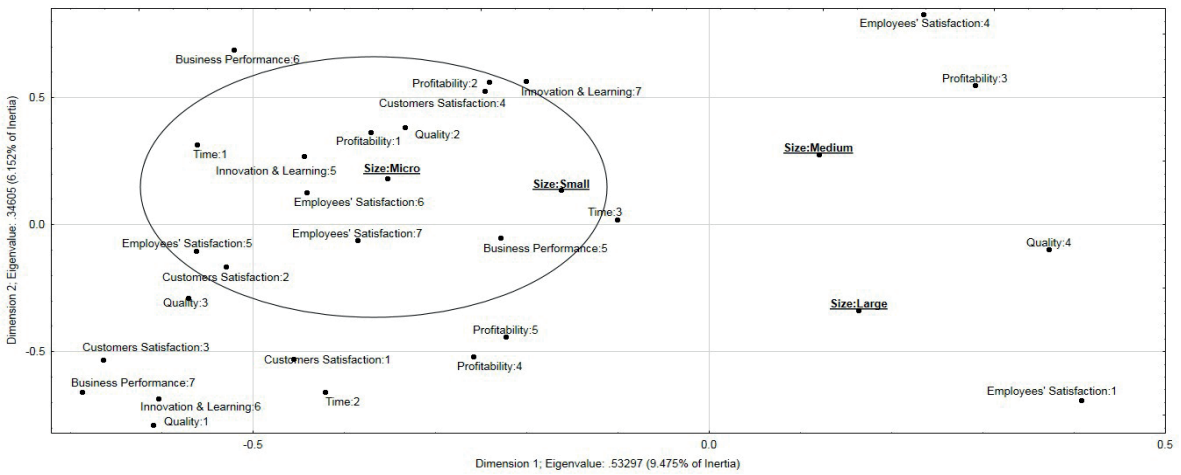


Fig. 5. Profile of the performance measurement system in the Egyptian construction industry (the company size vs performance measures)

proposed PMS. However, to fully understand the performance assessment in the Egyptian construction industry, the contribution of each of elements to the overall structure of PMS in the Egyptian construction industry was examined. To establish the contribution of elements, the Relative Importance Index (RII) was computed. The results of the analysis are shown in Fig 6.

It was assumed, that the components of proposed measurement framework with RII values above 50% cut-off could be considered as significant elements of PMS. Two groups of elements have been identified. The first has the highest observed importance and includes two elements, namely, the time of project delivery and the quality of construction works. Though the significance of time and quality as performance measures diminishes depending on the size of

a company, the lowest values of RII in the first group equals to 66%. Customer satisfaction and company's profitability are in the second group of PMS elements. The importance of these elements fluctuates yet oscillates around 60%. The remaining three components (employee satisfaction, business performance and innovation and learning) are below 50% of the relative importance and cannot be considered as measures of the Egyptian construction companies' performance.

#### 4. DISCUSSION OF THE RESULTS

The presented results and findings indicate the dominant share of in-house developed perfor-

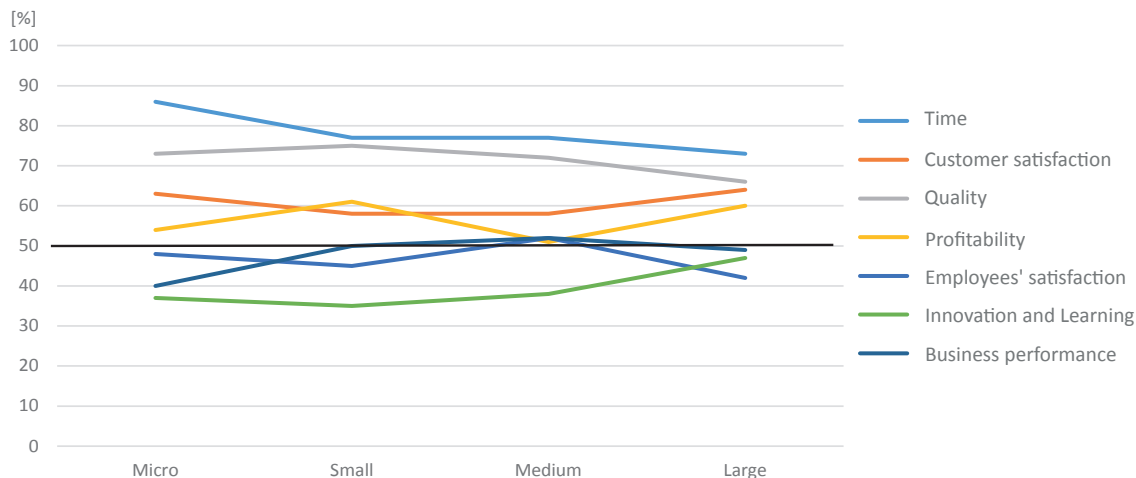


Fig. 6. Relative importance of performance measures in the Egyptian construction industry [%]

performance measurement systems among the surveyed Egyptian companies. Only large construction companies evaluate their performance using the established performance measurement methods. However, the levels of knowledge and use of the established PMSs among large enterprises are low. Results point to KPIs as the most popular method of performance measurement in the Egyptian construction industry. Interestingly, the highest share of KPIs use was observed among medium-sized construction companies (almost 40%). These findings are supported by Hudson et al. (2001) who claimed that the available systems of measuring performance are designed to evaluate the performance of medium to large-sized companies. Neely (1999) explains that SMEs do not use PMSs due to the excessive cost of producing performance measures. Therefore, it is more practical for SMEs to benchmark their performance internally with the measurement of the previous years or by establishing their performance assessment tool. Most of the surveyed Egyptian companies rely on assessing their performance comparing non-financial records with the previous year's results.

The correspondence analysis results revealed a detailed profile of measurement system used by Egyptian companies. Measures of client satisfaction (including the time of delivery and the quality of works) and profitability are perceived as key measures of company's performance. Additionally, the highest importance (measured by RII) is given to time and quality. A profit-driven approach to the company's performance measure is clearly shown.

Although the Performance Management Maturity (PMM) assessment was not an aim of the research,

findings could serve as an indicator of PMM level. The Egyptian construction industry can be classified at the premature PMM level (Aho, 2009). That is due to the crucial role of profits and costs in performance assessment. The role of a Performance Management System in surveyed companies is reduced to a simple business support function. However, a shift towards higher levels of PMM can be observed. A gradual inclusion of employee satisfaction and a moderate move towards acknowledging innovation and learning elements in performance measurement systems of medium and large companies indicate the redefinition of PMS's role from business support to business improvement.

## CONCLUSIONS

The study shows that Egyptian construction companies use their systems and compare results with data from previous years to measure performance. KPIs are mostly used as a method of performance assessment. Results of the study provide a deeper understanding of the components used in practice of performance measurement in the Egyptian construction industry. The proposed research model has been reduced to four components: time of project delivery, quality of construction works, profitability and customer satisfaction. These elements could be clearly related to project management principles (time, cost, quality) which are traditionally associated with project success. Since construction industry is a project-based industry, successful project delivery has the greatest influence on customer

satisfaction, hence, a company's profits. Therefore, a company's profit as a performance measure is perceived as the best performance indicator in the Egyptian construction industry.

The developed performance measurement profiles explain only 15% of inertia; therefore, the model needs further validation and development. The inclusion of country-specific elements in performance measurement and enlarging the data sample might improve the quality of the model.

The analysis revealed a difference in the PMS profile and the importance of PMS's elements between SMEs and large companies. However, the causes of that difference are not clear. One of the reasons might be the effect of a company's size and staff-related abilities for data processing. Another could be the globalisation of economic activity and the influence of multinational companies operating in Egypt. Further studies relating to PMS with large companies' management and capital structure could improve the understanding of performance measurement practice in the Egyptian industry.

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