Al-Azhar University Civil Engineering Research Magazine (CERM)
Vol. (41) No. (1) January, 2019

A Construction bid's markup Factors Identification in Egypt

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ملخص البحث

تحديد القيمة المثلي لهامش الربح والتي تشمل صافي الربح، تقديره للمخاطر المتوقعة وتكلفة التمويل مع تغير عائد الاستثمار للمشاركة بالمناقصات التنافسية التي يفوز بالترسيه فيها العطاء الأقل قيمة والمقبول فنيا، حتى يضمن بقاءه في قطاع المقاولات. فهناك كثير من الشركات تقوم بإعداد عطاءها دون الفوز بالعقد. تقدر نسبة هامش الربح نسبة من مجموعي التكاليف المباشرة والغير مباشرة والتي يتسم تقديرها ببعض الصعوبات لتداخل كثير من العوامل الكمية والكيفية باختلاف تأثيرها سلبا او ايجابا منها حدة المنافسة التي تجبر المقاول علي التنازل من جزء من ارباحه بالإضافة الظروف الاقتصادية الحديثة دائمة التغير في ظل عدم التأكد وتضخم اسعار الوقود وتحرير سعر الصرف الذي بدوره يؤثر على تضخم اسعار مواد البناء وزيادة العائد على قروض مشروعات التشييد واخيرا حاجة المقاول الي تنفيذ المشروع للحفاظ على البقاء. لذلك يقوم البحث بتحديد العوامل الاكثر تأثيرا واولوياتها في تحديد القيمة المثلي لهامش الربح من خلال استبيان بطريقة دلفي المكونة من دورتين. الاولي بجمع جميع العوامل من المتخصصين في تسعير العطاءات بقطاع مقاولات التشييد والبناء لدراسة واقعية. الدورة الثانية بتحديد درجة تأثير كل عامل على حدة في صنع القرار. ثم استخدام الدراسات الاحصائية لنتائج الاستبيان وتحديد أكثر عشرون عامل لأخذ تأثيرها في الاعتبار عند تحديد النسبة المثلي لهامش الربح.

ABSTRACT

The rapid development of the construction industry and the challenges of increasing the size and complexity of construction projects and Due to the instability in economic fluctuation circumstances in Egypt the recent years increase the importance of project management science.

This paper is concerning about the contractor's estimation of optimum Mark-up size decision in construction projects in competitive tendering awarded on the basis of the lowest tender that meets the stated specification that must be small enough to ensure a good chance of winning the contract and not big enough to realize a reasonable profit. This decision is a high complex process characteristic with uncertainty, risk, dynamic, economic fluctuation and involves a large quantity of objectives and reflection of several internal and external factors with several dimensions some of which cannot be easily quantified. Accordingly, experience and personal judgement come into play to a great extent in shaping this decision. Thus, we use the Delphi technique based on expert opinion survey when tackling significant decision-making that will set the future directions to make a decision support system that reflect new vision and method to adapt the economic changes and relate the decision with each factor's effect whose varies from project to another to be adjusted with this turmoil changes.

Few contractors carry out construction activities without actually winning a tender but most contractors will only survive and make profit in the industry by winning tenders.

The paper hypothesis is how this decision is made by identify factors that have a significant on bid mark-up decision in Egypt in either open or closed bid system. Forty-five quantitative and qualitative factors were identified and classified into criteria and sub criteria then We use SPSS (Statistical Package for the Social Sciences) software and by

using step wise regression model to generate the most significant factors considered for markup size decisions. Need to work, anticipated rate of return, project complexity, the risk involving owing to the nature of the work, and the competition are the highest ranked factors affecting markup size decisions in competitive tendering.

Key words: bidding, markup, expert, factors, survey, tender, fluctuation.

INTRUDUCTION

The construction industry is one of the largest and most important Regulator of countries economic on the Arabian and international levels. Today, construction companies play a prominent role in economic activity for their contribution to the implementation of major construction projects, which in turn constitute the infrastructure of the community. Examples of such construction projects include the construction of residential and administrative buildings, paving of roads, construction of bridges and the establishment of schools and hospitals.

Egypt faced a lot of economic affairs which affect directly on the construction sector which consider one of the most affected sector. Such as: -

- Global crises (such as the global financial crisis in 2008 and the European crisis in 2011).
- Local crises following the events of the revolution of 25 January 2011.
- Egyptian currency float 2016.
- Implementation of Value Added Tax (VAT).
- Increase in fuel prices .2018

The weakened of real estate sector has a negative significant impact on the construction industry during the last years as a result of political turmoil and land-related legal disputes, making the real estate sector face risks related to project execution, financing and sluggish sales. Therefore, the projects take a longer time and this will escalate costs and put new burdens on contractors. Some housing projects could now stop while a large number of contracting firms could be forced out of the market. Today, Egyptian governments have struggled to develop a vision for a new economic model, while simultaneously implementing populist policies to make a thriving economy that provides jobs and shared prosperity to all its citizens, the government will have to make immediate efforts to implement policies to achieve that goal.

Tender means the Contractor's priced offer to the Employer for the execution and completion of the Works and the remedying of any defects therein in accordance with the provision of the Contract, as accepted by the Letter of Acceptance. (FIDIC 1990).

The bid price comprises an estimate of the direct cost, indirect cost and a mark-up. The estimated direct cost is the sum of labor, material and equipment costs that are assumed to occur in the execution of the project plans and specifications. The indirect cost is the sum of all costs. that are traceable to the project but which are not traceable to a single activity. This account is designated as job overhead. The mark-up is a percentage of the estimated direct cost which a contractor adds to the estimated direct and indirect costs to account for profit and contingencies. The size of the mark-up for a contractor varies from one bid to another, depending on a multiplicity of internal and external factors that are encountered in each mark-up decision. The very existence of a construction firm depends on its ability to assign an appropriate mark-up (1) which produces enough jobs and significant profits. Therefore, it is a must that each contractor develops a strategy for determining this mark-up which allows the company to achieve its objectives under

different bidding situations so that contractor's markup decision is important decision in bidding preparation stage to win competitive tendering.

RESEARCH OBJECTIVES

The main objectives of this paper are:

1- Identify the factors influencing a contractor's decision to set the markup size for pricing a job in Egypt.
2- Classify and specify the Qualitative and Quantitative Factors.
3- Make data analysis from collected survey were compiled and Processed using mathematical and statistical techniques.
4- Evaluate the importance of the identified factors to the decision-making process.

The role of the contractor's estimates is vital to the success of the organization. In the past most of the top contractors depend on subjective assessment in making markup size decisions. Experience and personal judgement come into play to a great extent in shaping this decision.

More recently, the estimating function has changed more in the last 15 years than at any time before. Many estimating duties can now be carried out by assistants using word processors, spreadsheets and computer-aided estimating systems. Researchers proposed the use of tools such as artificial neural networks to develop a decision support system for estimating bid mark-up size which based on historical data base. They evaluate many influencing factors whenever they make either decision.

In present time we have to design a decision support system that reflect new vision and method to adapt the economic changes and relate the decision with each factor's effect whose varies from project to another.

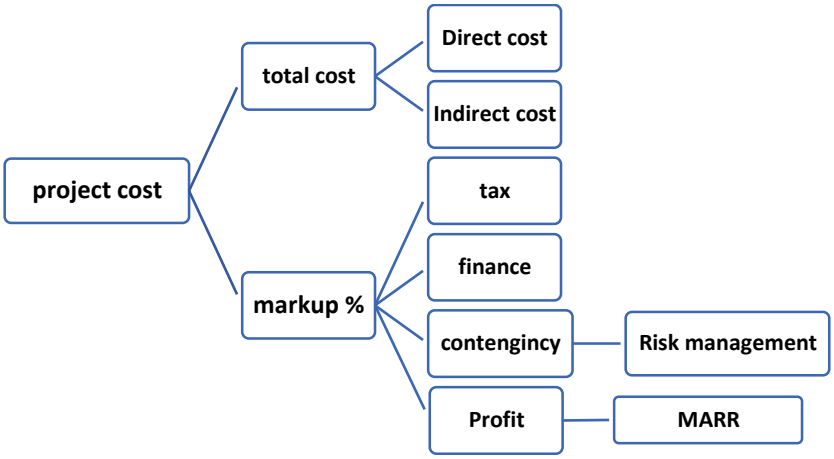

Figure1 project cost break down

Markup decision Factors identification and data collection

The Delphi technique is proposed to be used in order to identify the most significant factors. Two rounds of questionnaires were held in order to ensure consistency of the results and achieve general consensus a questionnaire that is to be distributed to Egyptian construction market professionals. Reliability and validity are critical properties of measures in all types of research. Essentially, some have challenged the Delphi method, claiming that the reliability of measures obtained from judgments is questionable – given that responses from different panels to the same question can differ

substantially, that the consensus achieved in later rounds might be due more to some pressure to conform than to a genuine converging consensus of opinions, and that the use of open-ended questions can make it difficult to assess measurement reliability and validity.

First Round

A review of literature different researchers has argued influence local contractors' bid mark-up decisions at the pre-tender stage of the project in Egypt. These factors have been grouped under five broad categories describing 1- economic environment, 2-project characteristics, 3-company condition, 4-project documentation and 5-bidding situation. Focus has been made towards similar studies conducted in Egypt in order to obtain the most relevant factors.

Data gathering form was developed based upon 45 factors identified from experts' interviews and literature review. The dataset was collected from

Second Round

A questionnaire survey was conducted to assess the impact of the identified affecting factors on markup decision in Egypt. A four-point Likert scale consisting four categories (1 low, 2 moderate, 3 high, 4 very high) (where 1 is the lowest influence of factor significant on markup and 4 is the highest influence. was adopted where respondents were asked to indicate the importance of each factors

FACTORS influence contractor's markup decision

As I stated earlier, two types of data exist: quantitative and qualitative factors. Quantitative data's major advantage is that it can be easily analyzed using mathematical formulas.

Qualitative data enables us to use logic and apply mathematical formulas to segment and compare the data as well as charts to assist in visualizing the findings. Quantitative data falls more to the scientific right on the decision-making spectrum introduced in.

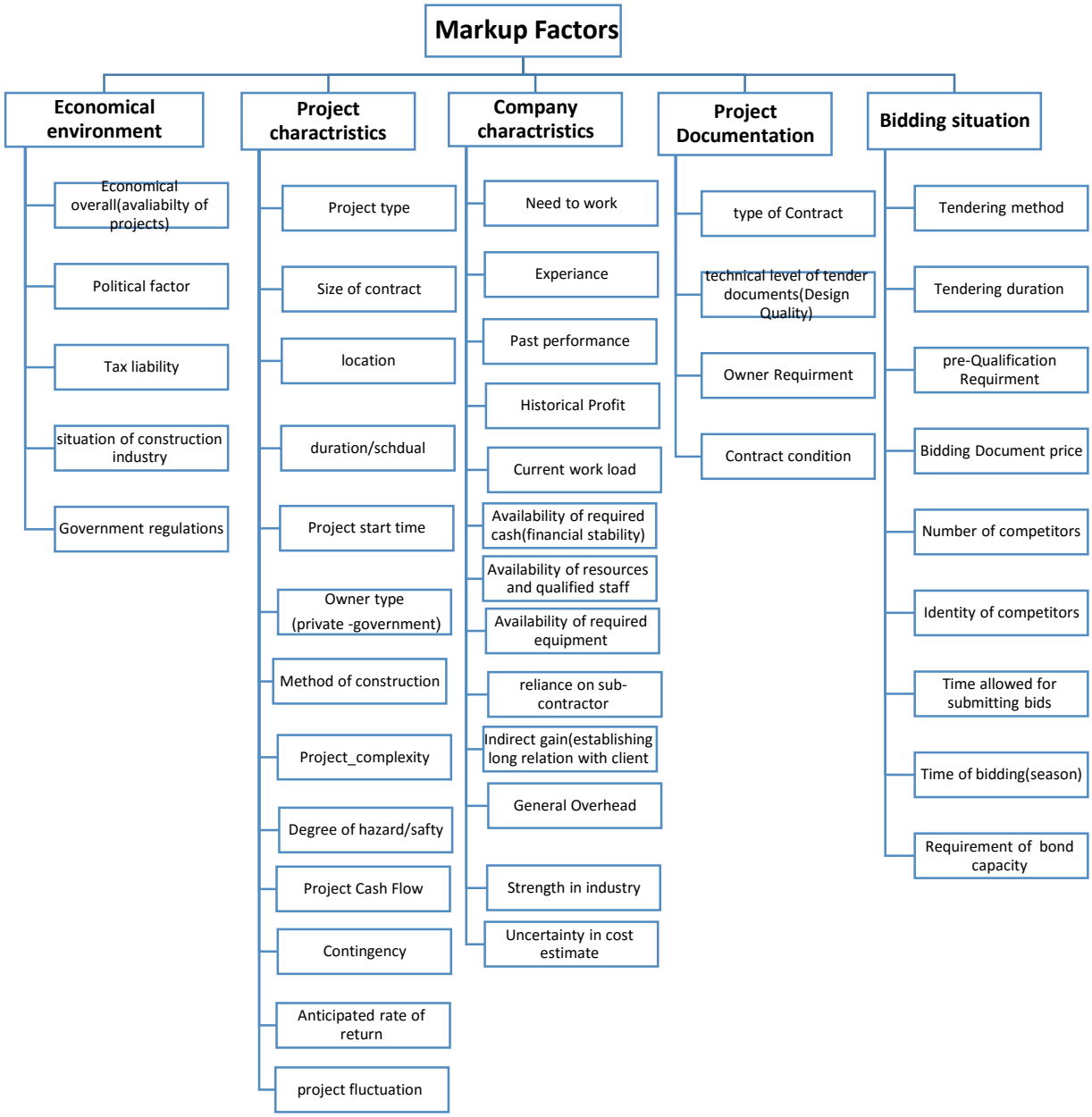

Figure 2: Bid markup factors identification

Statistics analysis

The data collected from the survey were compiled and Processed using mathematical and statistical techniques. They included simple mathematical calculations together with the more sophisticated statistics program Statistical Package for the Social Sciences (SPSS). These techniques made it possible to analyze and examine certain aspects of the bidding environment, the 'Factor weight' of the different factors that may have an impact on contractors' bid mark-up decisions, and the likely variation between responses from large and medium contractors. The research used the importance index to assess the importance contractors attach to the different factors. To generate equation.

The factors affect markup size decision questionnaire is collected the replies obtained from Egyptian construction contractors through direct contact, social media and survey website (www.monkeysurvey.com). These tests include; correlation, reliability, and ANOVA (Analysis of Variance) tests.

In the begging we must put simple description about our statistical techniques used in the study to get our results using statistical package for social science program (SPSS) v .24

Factors reduction using stepwise regression

Stepwise regression is an essential technique does multiple regression a number of times, each time removing the weakest correlated variable. Which requires two significance levels: one for adding variables and one for removing variables. The cutoff probability for adding variables should be less than the cutoff probability for removing variables so that the procedure does not get into an infinite loop. At the end, the variables that explain the distribution best. The only requirement is data normally distributed (or rather, that the residuals), and there is no correlation between the independent variables (known as Collinearity).

Ex: the effect of size of project on markup.

- **ANOVA analysis**

Table1 illustrate the value of (sig=0.000) is less than (α=0.05), so that the model is significant, in other words there are many independent variables affecting the dependent variable.

Table 1: ANOVA analysis significant test

ANOVA					
	Sum of Squares	Df	Mean Square	F	Sig.
Regression	6.718	24	0.280	992.054	0.000
Residual	0.006	20	0.000		
Total	6.724	44			

- **Coefficient of determination (R squared)**

It is a statistical measure show the ability of the independent variables (total factors) to explain the variations in the dependent variables (markup). it`s values range between 0 to 1. It is a good indicator if it was close to 1 Preferred to be used in the case of one independent variable. The amount that R-Squared change if the status of this variable changed. If the variable is currently in the model, this is the amount the R-Squared value would be decrease if it were removed. If the variable is currently out of the model, this is the amount the overall R-Squared would be increase if it were added. Large values here indicate important independent variables. You want to add variables that make a large contribution to R-Squared and to delete variables that make a small contribution to R-Squared. Preferred to be use in the case of one independent variable according to the rule:

$$R^2 = \frac{explained\ variations}{total\ variations} = \frac{sum\ of\ squared\ regression}{sum\ of\ squared\ total} = \frac{SSR}{SST}$$

Where SST, SSR from the table of ANOVA, $0 \leq R^2 \leq 1$

Table 2: Coefficient of Determination

Model Summary			
R	R Square	Adjusted R Square	Std. Error of the Estimate
1.000[ab]	0.999	0.998	0.01680

Table 2 present the value of adjusted R squared is 0.998, so it is very good value and we can say that the independent variables managed to explain almost variation in the dependent variable.

This module is to illustrate the effectiveness a set of top twenty key factors and their relative importance weights is an initial step toward developing a new technique-based on expert system.

Table 3: Coefficients table

Coefficients				
	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	2.298	0.022	102.837	0.000
Pre qualification requirement high	0.170	0.025	6.690	0.000
owner_type_moderate	-0.288	0.010	-28.665	0.000
situation_of_construction_industry_very_high	0.312	0.011	27.312	0.000
projected_cash_flow_required_during_execution_moderate	-0.279	0.018	-15.522	0.000
requirement_of_bond_capacity_moderate	0.323	0.013	25.494	0.000
time_of_bidding_season_high	0.300	0.022	13.579	0.000
duration_very_high	0.185	0.011	16.283	0.000
contractor_financial_stability_high	0.217	0.013	17.363	0.000
location_very_high	0.423	0.014	30.591	0.000
requirement_of_bond_capacity_very_high	0.435	0.020	21.891	0.000
contractor_financial_stability_very_high	0.198	0.018	11.163	0.000
degree_of_hazard_high	-0.162	0.013	-12.062	0.000
location_high	0.159	0.009	17.936	0.000
tendering_method_high	0.062	0.010	5.938	0.000
past_performance_high	-0.257	0.017	-15.558	0.000
bidding_document_price_moderate	-0.064	0.009	-7.236	0.000
number_of_competitors_moderate	0.052	0.008	6.265	0.000
past_experience_very_high	-0.197	0.016	-12.235	0.000
degree_of_hazard_moderate	0.092	0.015	6.014	0.000
strength_in_industry_high	0.084	0.009	9.237	0.000
pre_qualification_requirement_moderate	-0.153	0.020	-7.491	0.000
project_fluctuation_very_high	-0.167	0.028	-5.899	0.000
anticipate_rate_of_return_high	0.048	0.012	4.030	0.001
project_complexity_moderate	-0.069	0.018	-3.815	0.001

The regression model shows that, in terms of competitiveness, contract size is more important than contract type. The most competitive contractors seem to be those with a

preferred contract size range. Contractors' competitiveness towards a contract type is affected by the degree of contract type standardization and sizes of contract contained within a contract type. The greater the degree of contract type standardization and the larger the sizes of contract within a contract type, the greater the likely competitiveness of bidders.

Conclusion

Uncertainties and ambiguities are characteristics in Setting up the right markup size percent contributes to completing the Project successfully.

The construction contract is not only an important contract, but also difficult and complicated. These difficulties are due to different reasons, especially the projects which are implemented for years, implemented in stages, the documents are released by many stakeholders and at different times according to specific request and specific objectives.

To improve contractor's awareness in deciding markup percent in competitive bidding for construction projects in Egypt; one must identify and recognize the influence of the main factors affecting it. This research has identified and, based on the quantified relative importance indices, determined the influence ranks of 45 factors causing cost variation for constructing projects in Egypt. The explored factors were classified under the following four primary classifications: (1) Economic environment; (2) Project characteristics; (3)Company condition; (4) Project Documentation and (5) Bidding situation.

To study the effect of participant's experience on the obtained results, the results were grouped under experience-based group of the participants and professional cadre of respondents. In this regard, it was found that the results are consistent. The results were compared by studying all participants to cope up with all the factors that cause cost variation for constructing projects in Egypt.

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