Factors Affecting in Cost Estimation Process for Construction Residential Projects

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Abstract:-

Cost estimation process in early stage plays an important role in the achievement of any construction project. Cost estimating is an assessment of the expected cost of any construction project. The accuracy of such estimate has a serious effect on the expected profit of the construction contractor. Hence, a certain contingency percentage should be added to the base estimate to improve the level of confidence. The process of cost estimating is materially affected by many factors. This aims of this research to identify the factors that affect the accuracy of cost estimation process for construction residential projects and the most common methods used in cost estimation process in Iraqi construction projects. The researcher conducted a number of personal interviews experts in the cost estimation process and then distributed 100 questionnaires to the engineers and experts have experience in the field of construction projects. Only 85 of them were recovered. The researcher used Pareto Analysis Technique to find the factors that have more significant impact on Cost Estimation Process The results showed that there are factors that significantly affect the cost estimate The results indicated that some factors are heavily considered to have high influence such as experience of estimator, market status, economic instability, accuracy of bidding documents, site conditions, total area of residential building, estimating method, project location.

Keywords:- Early cost estimation, Accuracy of cost estimation, Pareto Analysis.

1. INTRODUCTION

Cost estimation is an essential part of construction residential projects, where cost is considered as one of the main criteria in decision making at the early stages

the reliability of cost estimation has a significant effect on the success of construction residential projects[1]. For example, it may have a serious effect on contractor capability to compete successfully with other contractors. It also possess an important effect on contractor's profit[2]. Therefore, this research is an attempt to recognize the most important factors affecting the accuracy of cost estimation in construction residential projects in Iraq. Such factors should be taken into consideration when preparing cost estimation for any future project.

it has been prepared the questionnaire in order find ways of cost estimate and the factors that affecting in cost estimation in Iraq's construction sector. Questionnaire is considered one of the adopted approaches in the scientific research field to better diagnose the project problems, personal interviews also been used to collect the necessary information and opinions from the senior management level and engineers working in the construction projects.[3]

2. OPEN AND CLOSED QUESTIONNAIRE

Personal interviews were conducted by the researcher with senior level of engineers working in the construction residential projects. The structured interview questionnaire started with ten questions. The questions which been divided into two parts, the first part includes general background information about the research sample, while the second part includes information about the cost estimation methods and factors affecting on the process of cost estimate. The interviews were conducted with a number of experts with great experience in the field of construction projects. Those experts involves engineers in Roads and Bridges Directorate, National Center for Engineering Consultancy, Engineering Construction Office, Al-Faw General Engineering Company, Al-Mansour Contracting Company, professors in colleges of engineering in Iraq and engineers in private sector. All of them have more than twenty years working experience in the construction sector in Iraq. Moreover, the expert interviews was helpful in building the baseline questions that focusing on construction projects cost estimation.

Before distribution the questionnaire forms, arbitration committee of (6) arbitrators were selected in order to evaluate the consistency of the questionnaire items and its relevance

to the research objectives. The purpose of pre-testing the questionnaire is to determine whether the questions as they are worded will achieve the desired results, whether the questions have been placed in the best order, whether the questions are understood by all classes of respondent, whether additional or specific questions are needed, and whether some questions should be eliminated[3,4]. Total number of (100) forms were distributed. Only (85) forms were completely returned.

The questionnaire forms were distributed to a number of the Iraqi state institutions as follows:

1.The Ministry of Housing and Construction (National center for engineering consultations, Roads and Bridges Directorate, Engineering Construction Office, and Al-Faw Company).

2. The Ministry of Planning

3. The engineering department in Baghdad governorate.

4. Number of academic professors in Engineering colleges (Baghdad University, Al Nahrin University, Al Masour University College, and Al-Esraa University College).

5. Number of experts working in private sector companies (Almajd construction contracting company, Adnan almusawy construction contracting company, Aldibaj construction contracting company, and Alhadbaa construction contracting company).

3. RESULT ANALYSIS

In order to be able to choose the exact method of analysis, the measurement level must be clear. For each type of measurement, there are an appropriate ways that can be used. In this paper, ordinal scales were used. Ordinal scale as shown below in Table (1) is a ranking system that normally uses integers in ascending or descending order. The numbers assigned to the important (10, 30, 50, 70, 90) do not indicate that the interval between scales are equal, nor do they indicate absolute quantities [4, 5].

In order to quantify data analysis and calculate the Relative importance (RI), a hypothetical Weight Value (WV) was attached to each of the five classes of answers available This Weight Value (WV) was chosen to correspond to the mid-range of each class on the five class decimal scale as explain in Table (1).

Relative Importance (RI): $RI = \frac{\Sigma(fi*W)}{N}$ Eq. (1)

The percentage is:

$$\text{Percentage } \% = \frac{\text{Number of frequencies}}{\text{total number of the answers}} * 100$$ Eq.(2)

Eq.(1) and Eq.(2) are used to find the Importance index for every factor that affecting on cost estimation . [6,7]

The last phase is the evaluation of the results by comparing them within the assumed intervals.

The details of personal qualification for the respondents are showed in Table (2) and figure (1).

Figure (2) illustrates the methods of cost estimation results display that the high ratio for Expert judgment by (40%), and by (35%) for Square-meter estimates, and by (8%) for Parametric estimating and by (10%) for Cubic-meter estimates while only (7%) for Analogous estimates.

Table 1. Weight Value of Descriptive Frequencies.

Category	Category Interval	Weight Value (WV)
Not important	0-20	10
Less important	20-40	30
somewhat important	40-60	50
Important	60-80	70
Very important	80-100	90

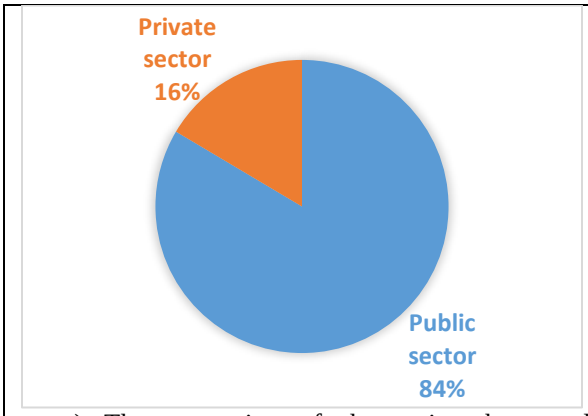
Table (2): Years' experience of respondent in the construction sector

Years	Frequency	%
<5	11	12.9
5-10	10	11.7
10-15	14	16.4
15-20	20	23.5
>20	30	35.2
Total	85	100

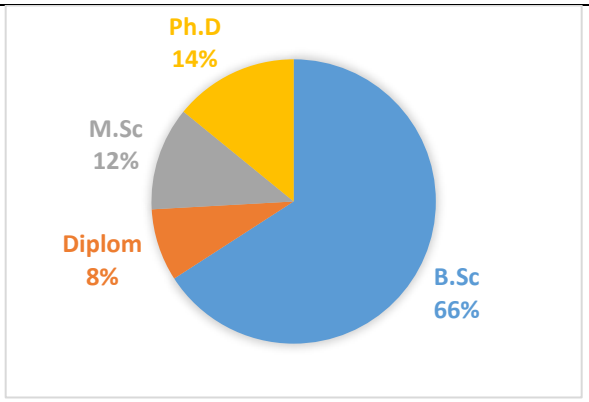
4. FACTORS THAT AFFECT ACCURACY OF CONSTRUCTION COST ESTIMATE

Based on the literature review and the results of interviews (open questionnaire), a thirty-nine factors that influence on process of building cost estimation were determined. These factors were used as a base for a questionnaire survey. Such survey identifies the most important factors influencing on the accuracy of the cost estimation.

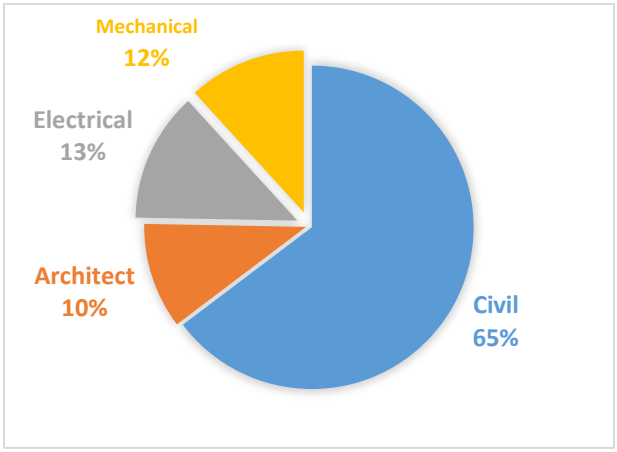
These factors were as display in Table(3).[3,4,5,6,7,8,9,10,11,12,13, 14, 15, 16 and 17]



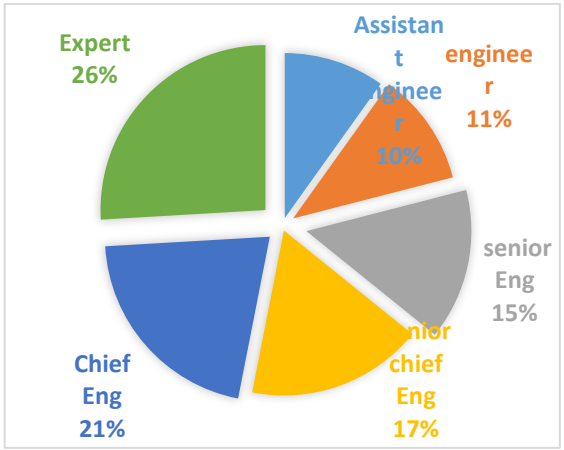
a) The proportion of the entity that conducts questionnaire



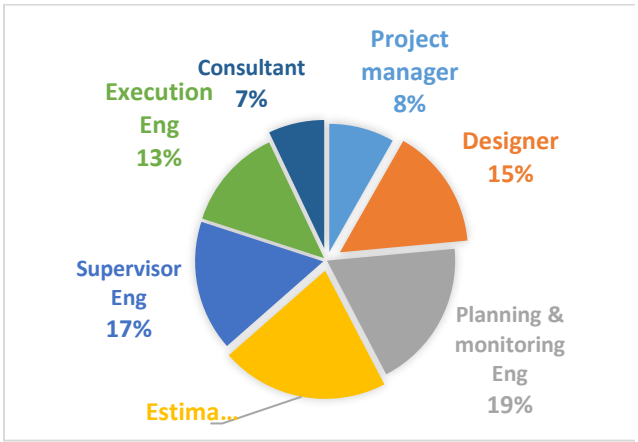
b) Proportion of scientific qualifications for research sample



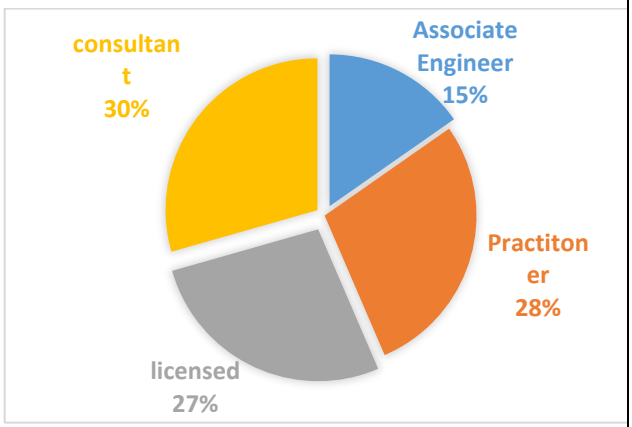
c) Various fields of engineering for research sample



d) Percentage of research sample to functional-grade



e) Percentage of function position for research sample



f) The proportion of classification guild for research sample

Fig 1. The Personal Qualification Details of Respondents.

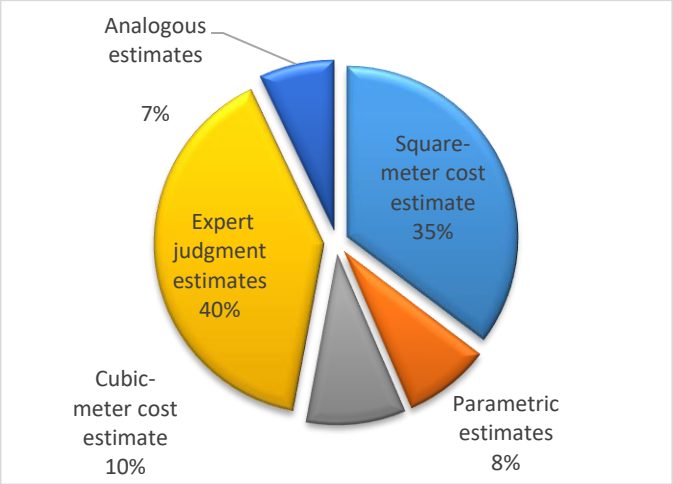


Fig 2. Methods of cost estimates in conceptual estimation.

Table 3. Factors that Affect Accuracy of Construction residential projects Cost Estimating

NO	Group	Factors affecting in the accuracy of cost estimation	Relative Importance %
1	Estimation Process	experience of cost estimator	87.65
2		Estimation way	80.59
3		The time allocated to estimation work	74.00
4		Updating cost information	65.76
5		Availability of the moderate cost indicators	78.00
6		Availability of productivity criterion	71.88
7		Procedure used in determining emergency and profit margin contingency	44.24
1	Bidding Situations	Accuracy of bidding documents provided by client	85.29
1	Characteristics of the project	Total area of residential building	83.88
2		The height of residential building	83.43
3		Competence and leadership of project manager	75.18

4		Project location	81.76
5		Site condition	84.82
6		Type of residential building	81.29
1	**Contractual Side**	Quality of company project planning and management	71.41
2		Impact of project schedule "expected to delay"	67.18
3		Availability of labor and equipment required	52.12
4		Owner experience level	62.82
5		Content of the project specifications	78.24
6		Delay Penalty	50.00
7		Unforeseeable change in work	72.71
1	**Executive Side**	Number of floors in the building	43.88
2		Number of elevators in the building	40.12
3		Soil type	53.29
4		Building foundation type	42.71
1	**Social and cultural side, weather side**	Weather Unexpectedly	47.41
2		Social and cultural impact	57.06
1	**Financial Matters Side**	Market status	86.94
2		Economic instability	86.47
3		Availability of management and finance plans	69.29
4		Commitment of periodical payments	63.65
5		Market Status	86.94
6		Currency exchange fluctuation average	70.94 %
7		Inflation impact	62.94 %

5. MOST IMPORTANT FACTORS

By examining the importance indices of each factor in table (3), it can be identified the factors that are heavily considered to have high impact on the accuracy of cost estimate process. These factors includes experience of estimating team, quality of firm's project planning and management, economic instability, estimating method, competence and leadership of project manager, availability of management and finance plans. On the other hand, factors such as Social and cultural impact, unforeseeable change in work, weather unexpectedly, have low impact.

6. PARETO ANALYSIS TECHNIQUE:-

Assumes that 20% of factors can have the most important effect.

Therefore, this percentage will lead us to the selection of the first ten factors as shown in table (4). [16]

Table 4. The most important factors that affecting on the cost estimating process

NO	Factors affecting in the accuracy of cost estimation	RI
1	experience of estimator	87.65
2	Market status	86.94
3	Economic instability	86.47
4	Accuracy of bidding documents	85.29
5	Site condition	84.82
6	Total area of residential building	83.88
7	The Height of residential building	83.41
8	Project location	81.76
9	Type of residential building	81.29
10	Estimating method	80.59

7. CONCLUSIONS

Some conclusions resulted from achieving this research can be summarized:

1. Questionnaire is considered one of the adopted approaches in the scientific research field to better diagnose the project problems and to know the opinion of the senior management level, consultants...etc.,

2. Many factors may effect on the accuracy of cost estimating process. The most important factors include

experience of estimating team, quality of planning and management activities, economic instability, adopted estimation method, expected delay, leadership of project manager, labor and
equipment required, and Availability of management and finance plans.

3. Regarding to the method of cost estimating adopted in most of Iraqi construction companies in the preliminary stage of project, most of respondents confirm that expert judgment and square meter methods are the most used method in the conceptual estimate

4. Through the literature review, the researcher found that the traditional methods of cost estimation weakness from the major disadvantages of the Imprecision and uncertainty, but a neural network methods Display various features above traditional methods for the prognosis of the construction projects cost.

5. Through the interviews and expert answers sample indicated that most projects don't use modern methods for estimating costs, but always they used on traditional methods to costs estimation in construction residential projects such as expert judgment estimates.

8. RECOMMENDATION

1. It is suggested for construction parties to take the eight factors that may severely influence in construction cost variance as mentioned in this paper into consideration when preparing cost estimate for just about any future project as follows:
   - ❖ Consider economic instability and project location when defining contingency value.
   - ❖ Assign qualified project manager, estimating team and planners.
   - ❖ Applying good management and finance plans.
   - ❖ Provide sufficient numbers of labor and efficient equipment.
   - ❖ Use specified estimates if possible.
   - ❖ Work with accurate bidding documents.
2. Built a simple program such as Visual Basic to foretell the cost estimation of construction residential projects, where data is entered.
3. All construction parties are encouraged to be more aware about cost estimation development and pay more attention for using new developed technique in estimation process.

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العوامل المؤثرة على عملية تقدير الكلف لمشاريع الابنية السكنية

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الخلاصة :-

تلعب عملية تقدير الكلف في المرحلة المبكرة من المشروع دورا هاما في انجاز ا. تقدير الكلفة هو تقييم للتكلفة المتوقعة لأي مشروع انشائي. وتؤثر دقة هذا التقدير تأثيرا كبيرا و خطيرا على الربح المتوقع لمقاول التشييد. ومن ثم، ينبغي إضافة نسبة مئوية معينة للطوارئ إلى التقدير الأساسي لتحسين مستوى الثقة. وتتأثر عملية تقدير التكاليف بصورة جوهرية بعدة عوامل. يهدف هذا البحث إلى التعرف على العوامل التي تؤثر على دقة عملية تقدير الكلفة لمشاريع الابنية السكنية والطرق الأكثر شيوعا المستخدمة في عملية تقدير التكاليف للمشاريع الانشائية. قام الباحث

بعمل عدد من المقابلات الشخصية لعدد من الخبراء المختصين في عملية تقدير الكلف ومن ثم توزيع (100) استمارة استبيان على المهندسين والخبراء المختصين في مجال المشاريع الانشائيةوتم استرداد (85) منها فقط.قام الباحث باستخدام تحليل باريتو لأيجاد العوامل التي تملك تأثيرا كبيرا على عملية تقدير الكلف وأظهرت النتائج أن هناك عوامل تؤثر تأثيرا كبيرا على تقدير الكلف مثل خبرة المخمن،حالة السوق، عدم الاستقرار الاقتصادي،دقة وثائق المناقصة،ظروف الموقع، والمساحة الكلية للمبنى،موقع المشروع، وعملية التقدير.

الكلمات المفتاحية:- التخمين الاولي للكلف، دقة تقدير الكلف،تحليل باريتو