

Civil and Architectural Engineering

Risks of Design Stage in Iraqi Construction Project

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ABSTRACT

The management of construction projects needs to complete the basics of system management and work. Starting from the idea and how to turn it into a full study and ended at the construction project completion arriving at the purpose prepared for it, so the projects need to control on its operation and integration system in order to succeed.

It is no secret for who concerned in construction projects field that the design stage is a very important stage in construction project because it determines the final features of the project through the requirements provided by the employer for the consultant to formulate it during this phase in the form of plans, drawings, and specifications, then translated on the ground as the shape of completed project meets those requirements.

Therefore it has been necessary to focus in this paper on the design stage also demonstrated and analysis the most important risk facing this stage and their impact on a construction project by introducing a questionnaire to identify the most important risks factors at this stage affecting on the project.

The paper had been shown that the effect of the design stage on Lump sum type of project contract was higher than the unit price, while the most important factor effect on a project its fast response of design team to prepare the design documents in order to facilitate the workflow and sequence of execution with effect level 3.714.

Keywords: risk, design, Iraq, projects, constructions.

مخاطر مرحلة التصميم في مشاريع التشييد العراقية

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الخلاصة

تحتاج إدارة المشاريع الانشائية إلى إكمال أساسيات إدارة النظام والعمل. بدءاً من الفكرة وكيفية تحويلها إلى دراسة كاملة وانتهاءً بإنجاز مشروع يحقق الهدف الذي حُطَّط الوصول إليه، لذلك تحتاج المشاريع إلى خطط للسيطرة على عملياتها وتكامل نظامها من أجل تحقيق النجاح.

إن مرحلة التصميم في مجال مشاريع التشييد مرحلة مهمة جداً في المشروع لأنه يحدد الملامح النهائية للمشروع من خلال متطلبات يقدمها صاحب العمل للاستشاري لصياغتها خلال هذه المرحلة في شكل خطط، رسومات ومواصفات، ثم تترجم على أرض الواقع على شكل المشروع المنجز ليُلبي هذه المتطلبات.

لذلك من الضروري أن نركز في هذا البحث على مرحلة التصميم وشرحها وتحليل المخاطر الأكثر أهمية التي تواجه هذه المرحلة وتأثيرها على مشروع التشييد من خلال طرح استبيان لتحديد أهم عوامل المخاطر في تلك المرحلة التي تؤثر على المشروع.



يوضح البحث ان تأثير مرحلة التصميم على مشروع معين يعتمد على طريقة التعاقد لذلك المشروع، فعقد من نوع المبلغ المقطوع هو اكبر تأثيراً على المشروع من عقد نوع الوحدة سعر، اما خلال مرحلة التصميم فان تأثير عامل سرعة استجابة فريق التصميم لاعداد المخططات والوثائق لتسهيل انجاز الاعمال هو اهم عامل و بمستوى تأثير 3.714. **الكلمات المفتاحية:** مخاطر، التصميم، العراق، المشاريع، الانشائية.

1. INTRODUCTION

The overall construction process, from programming to design and through to construction, involves many key participants who need to collaborate continuously in order to complete the project on time, on a budget, and to the level of quality and functionality that the owner requires. However, construction projects have a tendency for key participants to work separately and focus on individual goals, rather than project goals. This tendency is a result of standard industry contracts and a legacy of litigation within the industry, **Christofer, et al., 2012**.

Client commissions a designer to produce a well-balanced building in terms of appearance, planning, construction, initial and maintenance costs. The customer expects an efficiently run contract and an amicable settlement of final account. In many cases, the client is an extremely efficient business organization and expects the contract to be run in a similar manner, **David, 2004**.

In order to achieve this, a designer is faced not only with organizing his own office but also relying on the support of scores of competitive sub-contractors, contractors, quantity surveyor, engineer and any specialists who are involved, **Ronald, 2001, and Martin, 2007**.

The role of the designer varies as per the type of project delivery system. In Iraq, the most governorate project applied the design-bid-build (D-B-B) type of project delivery system.

In D-B-B system most of the tasks assigned to the designer were considered completed upon delivering of design documents, while a limited contribution of the designer is needed during the implementation phase, **William, et al., 2003**.

In the design-build delivery system, whether the design works are simultaneous or prior to the implementation of the project, in both cases, the designer has a significant impact on the progress of the project completion and he represents an important element that may affect the project, **Sidney, 2006**.

Design errors can adversely influence project performance and can contribute to failures, accidents, and loss of life, **Robert and Peter, 2012**.

Therefore it has been necessary to focus in this paper on the design phase and its effect on a construction project.

The methodology of this research consists the following:

1. Conduct a questionnaire survey with experts and collected data to conclude the most important risks factors deal with design stage and their effect on a construction project.
2. Analysis the questionnaire output in order to summarize the results, conclusions, and recommendations for the future studies.

2. SCOPE OF STUDY

The scope of this study was to determine the impact of the design phase and methods of contracting with them on the projects, therefore an extensive structured interview had been conducted with more than five experts (of more than 20 years of experience in handling the construction project design) in order to review the preliminary questionnaire form. Experts feedback had been considered to adopt in the preliminary questionnaire to ensure the fulfillment of the proposed questions with the purpose of the study.

Also, the questionnaire gives a freedom of expression to all respondents to view their note or opinions on the research subject.



3. FIELD SURVEY AND QUESTIONNAIRE PREPARATION

The objective of the questionnaire was to collect sufficient statistical and qualitative data to help in answering the questions raised by sub-problems and to help make conclusions on whether the expert's hypotheses are proven or not.

An interview was arranged with a respondent whenever there were issues in the questionnaire that needed clarification or the information on specific questions disagreed with the consideration survey in an essential manner.

Fieldwork had been visited and a personal meeting conducted to enrich the initial questionnaire paper by different opinions, suggestions, and proposals that considered being part of the final questionnaire sample.

4. SAMPLE COMPOSITION

The respondents consisted all construction industry practitioners, including project managers (as owner), main and sub-contractors as well as consultants and engineers, as in **Fig.1**.

The respondents were classified in **Fig. 2**. According to their educational background, there were individuals who earned the doctorate degree and were qualified with a percentage of 34%, Master's degree participant's percentage is 8% and the remaining individuals are B.Sc. certified with the percentage of 58%.

5. DATA ANALYSIS

In order to assess the effect of each factor, the answers were collected from all surveyed samples (employers, engineers, contractors) whereas the questionnaire form number that had been successfully received were seventy (70), **Douglas, et al., 2011**.

The results have been analyzed and discussed depending on the "mean" of these results which is one of central tendency (the tendency of value to center on the optimal value). The statistical analysis process of the results is presented in the following:

5.1. Effect Level

The effect level was assumed for each category of an answer as explained in table 1. This category of the answer was assumed in order to facilitate the process of analyzing data results.

5.2. The Arithmetic Mean

The arithmetic means for answers calculated as follow:

(Mean) = (total of the number of iterations in the effect multiplied by the number of effects divided by the size of the sample).

The arithmetic mean is used in the analysis for each factor of the sectors.

5.3. Upper Quartile

The analysis and evaluation of the questionnaire results were adopted for each factor in the questionnaire through calculating the upper quartile for the answers' average, which represents the upper value of 75% from the values of table 1, then $UQ = 3$ which is the target value, **Douglas, et al., 2011**.

By this way the evaluation of the questionnaire result has been done according to the level of the target value as the following:

- 1- If $(M > 3)$ then the discussion was required for the factor.
- 2- If $(M \leq 3)$ then the discussion was desired for the factor.



6. RESULTS ANALYSIS

The questionnaire results were arranged according to the effect level of each factor. Factors that have mean value more than 3 were identified to be considered in the study's conclusion. The cumulative arrange was adopted in the classification of the considered factors in the following sections:

6.1. Method of Contracting with Designer Effect

The contracting with a designer is the starting point for any project since the contract includes the consent of both parties on the terms, duration, and amounts that should be identified in advance.

So, any defect or error in procedure or even change during contracting phase may lead to various deviations from what had been planned and expected. Accordingly, it is necessary to study the effect of this stage.

The effect of contracting with designer sector may vary from factor to another such as the participants responded that the effect of the design stage on Lump sum type of project was higher than the unit price while the participants' opinions show that the Fragmental contracts had more effect from the continuous contract.

Table 2. Presents the factors that most affect on the project in contracting with the designer. The factors are prioritized as per their type and shown their effect level.

6.2. Design Stage Effect

Data collected was shown that the most important factor effect on a project its fast response of design team to prepare the design documents in order to facilitate the workflow and sequence of execution with effect level 3.714. While the founding overlap between design and execution duration came in the second important with effect level 3.62, table 3 presented the most design stage factors effect on the project quality.

7. CONCLUSIONS

After viewing the received opinions and note, data were studied and analyzed to conclude the results of the research. This research revealed the following conclusions:

- 1- Selecting the design company based on the lowest bid price was considered the most factors that negatively impact on the construction project due to the insufficient qualification of the selected designer.
- 2- Percent of estimated cost contract is considered the most contracts type that been subjected to claims raised because of lack of defined contract price lead the consultant to increase the project quantity to get higher wages.
- 3- Using scientific techniques and modern programming methods in preparing drawing is an important factor to utilize the facilities available within such methods, hence updating of the drawing would be more accurate and quick.
- 4- Routine and bureaucracy in communication between owner and consultant lead to tangible delays in Iraqi construction projects.
- 5- The owner should give his authorities to the consultant or his representative in case the owner does not have the sufficient construction experience.
- 6- The consultative team (designers and supervisors) does not dedicate itself in the continuous mentoring for the work and workers.
- 7- The supervising committees should include many experts required to supervise the project works in order to provide the necessary clarifications and instructions.



8- Lack of drawings and design documents accuracy is one of the most important factors affecting project time during the design phase, in addition to neglecting to mention important details which are considered the requirements for executed works items.

9- Most of the projects are suffering lack of communications between parties.

10- Most of the projects are suffering lack of design software packages that enable parties to supervise and control the project.

11- There is no gained benefit from the experiences extracted from the previous projects in order to avoid mistakes during design and execution of current projects.

12- There is no dependency on experts and responsible managers who have enough qualifications that are essential for time-saving through avoiding the routine managerial procedures.

13- The finished design documents were quickly delivered to contractors who do not have the sufficient qualifications.

8. RECOMMENDATION

According to the respondents, notes were listed in the questionnaire, the study had been finished to following recommendations:

1. Many other stages on the project life have effective impact on its work and every one of this stage need to be studied.
2. Iraq construction project was needed to exist an institution taking in its mind the planning to the projects and find the relevant way to e execute it in a good shape.
- 3- The Participation of the owner and engineer with the designing team during the preparation of the drawing is requested in order to fulfill all owners' requirements and avoid any change concerning the design.
- 4- Providing training courses related to works performance methods is essential in order to extract the experience needed during the execution of the works in a satisfactory manner at a suitable duration to avoid repeating the works due to lack of quality.
- 5- It is necessary to obtain a contribution between designers and executors when preparing documents at the design stage.
- 6- The consultative team must have enough time to study the project specifications carefully that may be reduced the change orders.

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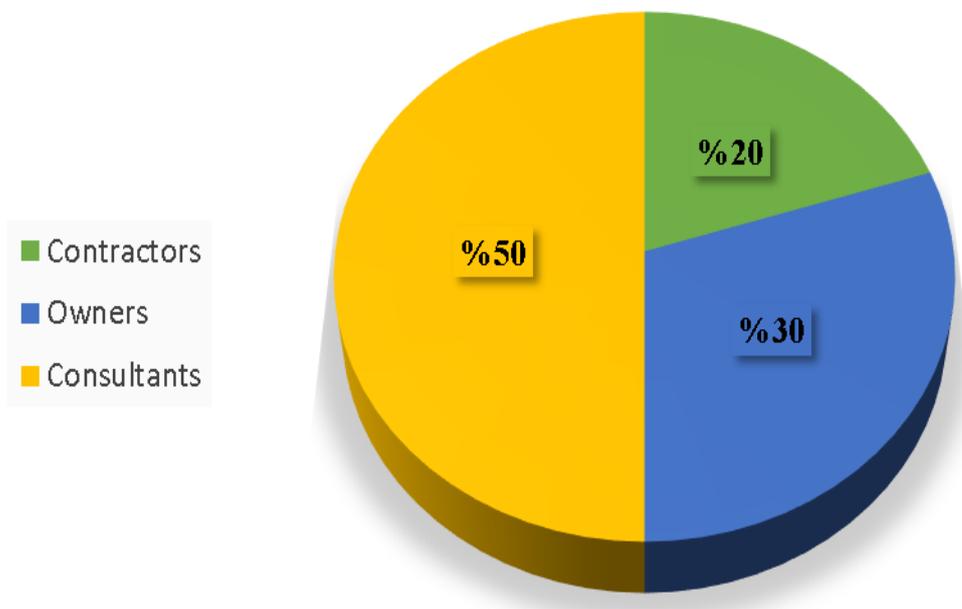


Figure 1. Sample composition according to their party.

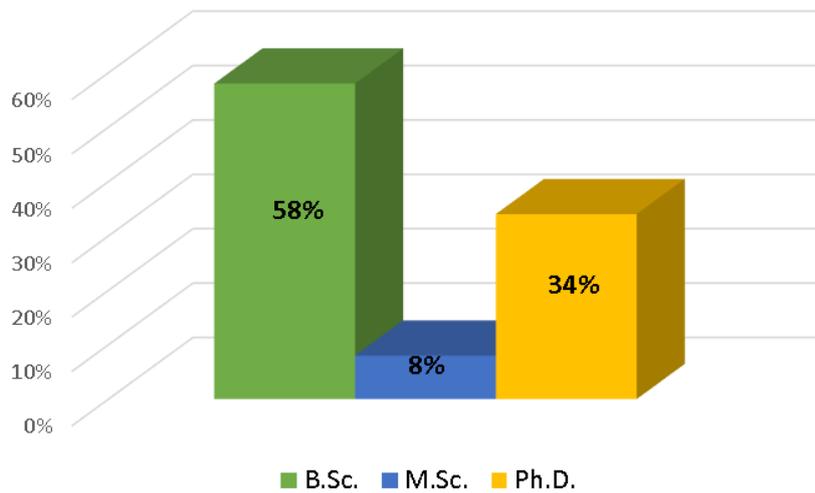


Figure 2. Sample composition according to their educational background.

Table 1. Evaluation of answer category.

Category of Answer (Risks Factor’s Effect)	Effect Level
No Effect	1
Little Effect	2
Medium Effect	3
Large Effect	4

Table 2. Data analysis for contracting with designer risks factors effect.

No.	Risks Factors	Effect Level	
1	Project delivery System	Design – Build	3.31
		Design – Bid – Build	3.04
2	Type of contract	Lump sum	3.26
		Unit price	3.01
3	Tendering method	Open tender	3.00
		Invitation	3.12
		Direct Order	3.04
4	Continuity of the project	Continuous one contract	2.93
		Fragmental contracts	3.13
5	The entity of owner	Governmental sector	3.01
		Private sector	3.00
6	The entity of Designer	Governmental sector	3.06
		Private sector	3.25
7	Referring the bids	The Lower Bids	3.67

**Table 3.** Design stage risks factors effect.

No.	Risks Factors	Effect Level
1	Understanding or participation and contribution of teamwork with positive opinions	2.585
2	Support the employer with ideas and views practicability whether in design stage or execution	2.671
3	Employer's fast response to approving the completed design	2.828
4	Lack of details was considered one of the requirements needed to complete the work items	3.057
5	Design changes during the execution	3.085
6	Design team fast response when a modification is required.	3.571
7	Design Documents Insufficiency.	3.585
8	Squeezing overlap duration between design and execution	3.620
9	Design team fast response to preparation the design documents in order to facilitate the workflow and sequence of execution.	3.714