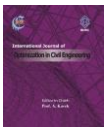
INTERNATIONAL JOURNAL OF OPTIMIZATION IN CIVIL ENGINEERING
Int. J. Optim. Civil Eng., 2016; 6(4):559-568



IDENTIFICATION OF REASONS FOR CLAIMS OF CONTRACTORS IN D-B-B CONTRACTS AND EVALUATION BY MULTI-CRITERIA DECISION-MAKING MODELS (AHP)

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ABSTRACT

The increasing complexity of construction, along with its rapid development, as well as ambiguities and gaps in the legal terms governing constructions, lack of trust in the parties regarding obligations and regulations are the main reasons of disagreements in domestic projects. These disagreements are inevitable even in contracts which are set correctly. Disagreements are costly, time-consuming and inconvenient. They also affect the price and quality of contracts. In most projects using different delivery systems, entities particularly contractors may make claims. Moreover, claims and disagreements are inevitable in Design-Bid projects, particularly in Design-Bid-Build (D-B-B) contracts, which are not commonly used in Iran. The focus of this study is the reasons for claims made in projects delivered by Design-Bid-Build (D-B-B) contracts. This study also observes claims related to consulting engineer of the owner. Accordingly, different criteria and sub-criteria are determined to prioritize by decision-making models.

Keywords: claim management; contractors; design-bid-build contracts; multi-criteria decision.

Received: 8 February 2016; Accepted: 25 April 2016

1. INTRODUCTION

Claims are an integral part of construction contracts which currently occur in a routine basis.

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Although contract claim is not a new concept, managers poorly evaluate the effectiveness of claims and respond to them [1]. Generally, development projects are complicated for their specific functional role. These projects involve a large amount of financial and human resources. Thus, a successful project is delivered on time with expected cost and quality as the requirements demand. Therefore, a project will be successful if the predicted time, quality and cost are satisfied. These three parameters can be exemplified by a triangle in which flaws and shortcomings of a side will affect other sides. These three parameters are also considered as the criteria and limitations of a project. Complexity, workload, duration and the number of members involved in the project can act as a platform for various disputes between different entities of the contract [2].

In order to satisfy final goals of the project, project management needs to dominate the factors effective on delays and changes to make predictions based on the conditions. Therefore, it is essential to overview the major causes of financial claims made by contractors [3]. Given the above, this study identifies and evaluates the most important reasons of claims made by contractors by field studies in construction projects, as well as interviews and consultations with relevant theorists and experts. Using a multi-criteria decision-making method, the reasons are prioritized to develop a model for claims of contractors on D-B-B (Design-Bid-Build) contracts. Claim refers to contractor's demand for extension or additional payment, while disagreement refers to the lack of agreement between entities concerning the claims, or other administrative aspects of the contract [4,5]. The disagreement between entities and the dispute will have devastating effects on the project, including interrupted delivery, discouraged entities, jeopardized contactor-owner relations, expensive time-consuming settlement, ignored documents, deeper disagreements and involvement of outsiders. Avoided or alleviated disagreements will be followed by significant economic savings in the projects [6,7].

According to the Iranian General Terms of Contract which presents an identical contract for D-B-B construction projects, the first channel of settlement is negotiation in the presence of an expert and then arbitration; however, unresolved disagreements constantly impose high costs on projects. Several effective factors, high turnover, specialized tasks, workload, innovation, sensitivity and diverse locations lead to complex, unique and dynamic projects [8]. Such conditions increase the risk of claims and conflicts in various stages of the project. It will be difficult to deliver construction projects, regardless of the potential disagreements and increased reliability of entities in resolving these agreements [9]. Development projects require time, budget and other resources acquired by relevant entities; these resources in turn create a right for the parties. Improperly contracted projects, unfair distribution of responsibilities and authorities as well as traditional approach and governing culture regarding contractors causes complexities in meeting the demands of contractors [10]. Obviously, this will weaken the financial strength of contractors and discourage them to work properly. Moreover, disagreements caused between entities may lead to early termination and extension of delivery schedule.

In most cases, claims are agreed at higher levels of ownership, i.e. board of directors, and solutions are provided; otherwise, the contractor will pursue his claims to legal authorities which may cause problems such as high costs and time of hearing and most importantly inclusion of outsiders in the project. Although these claims may compromise the project, underestimation of claims and disputes can cause problems for the project [11].

Accordingly, the present study identifies the reasons for claims of contractors considering the problems of construction projects, particularly D-B-B projects, to provide a preventive solution for disagreements of contractor and owners.

2. METHODOLOGY

This study used an applied, descriptive survey. Data was collected by interviews with experts in the construction industry, particularly D-B-B projects. Accordingly, reasons for claims of contractors were evaluated by experiences of finished and ongoing D-B-B projects. To this end, major causes were identified among 300 reasons extracted from archival studies, available theses and interviews with experts. Then, interviewees were given checklists. Data was analyzed by pairwise comparisons based on judgments of respondents using multi-criteria decision-making analyses such as AHP.

AHP (analytic hierarchy process) is a powerful thorough technique for making decisions using empirical data or personal judgments of the decision maker. AHP facilitates the decision-making process by providing a structure for organizing and evaluating the importance of different criteria and priority of options for decision-makers [12].

2.1 Hierarchical model

The first step in AHP is to provide a graphical presentation of the problem. The problem has 3 options and 15 criteria, and depicted in Fig. 1.

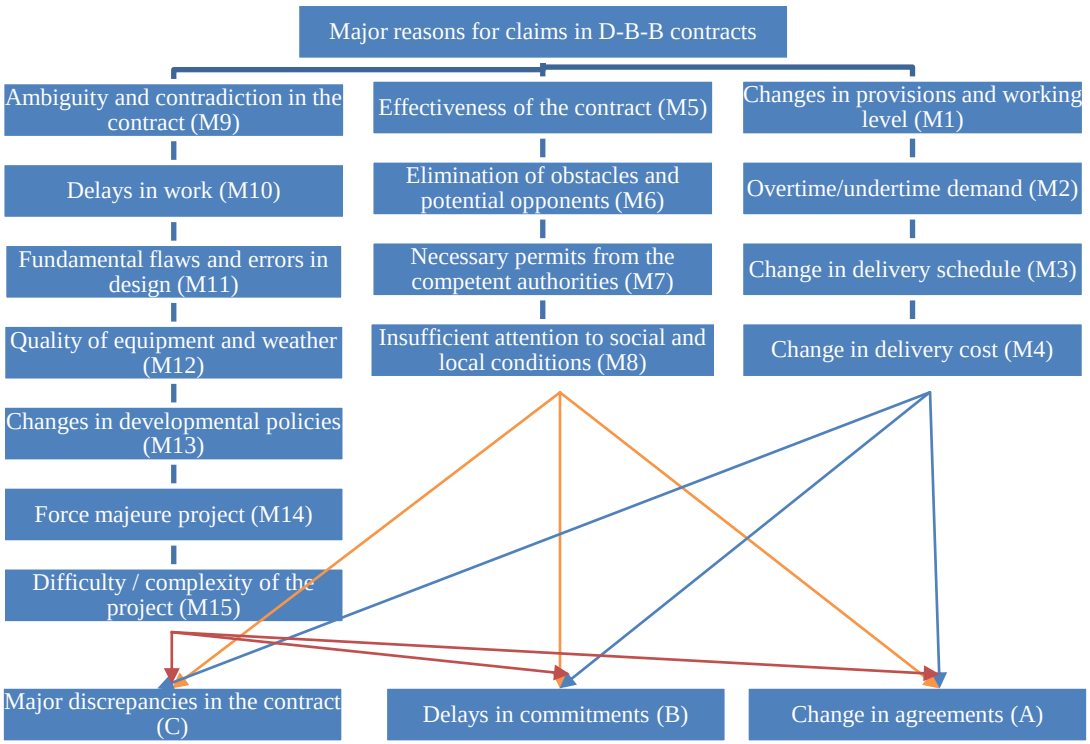

Figure 1. AHP options and criteria of claims

2.2 Relative Weight of Criteria and Sub-criteria

To derive the pairwise comparison matrices and calculate the weights of criteria and sub-criteria, a questionnaire was developed and given to the relevant decision-makers. Each question (comparing two criteria or sub-criteria) was assigned a weight from 0 to 9 (based on numerical value of the priorities of oral judgment by Saati) [12]. The weighted importance of the questions ranged from moderately more important (3), more important (5), strongly more important, (7), very strongly more important (9) and equally important (1), moderately unimportant (1.3), unimportant (1.5), strongly unimportant (1.7) and very strongly unimportant (1.9). The values 2, 4, 6 and 8 were the median values for scale. By geometric mean of responds, pairwise comparison matrix of options and criteria is shown in Table 1.

Table 1: Evaluation of criteria

Criterion	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
M1	1	**5**	**4**	**6**	**6**	**7**	**2**	**6**	**5**	**6**	**6**	**6**	**5**	**4**	**3**
M2	1.5	1	**3**	**5**	**4**	**5**	1.3	**4**	1.2	1.4	1.4	1.2	**2**	1.3	1.5
M3	1.4	1.3	1	**3**	1.4	**2**	1.3	**3**	1.3	1.3	1.4	**3**	1.3	1.4	1.5
M4	1.6	1.5	1.3	1	1.4	1.3	1.4	**2**	1.5	1.4	1.5	1.4	1.3	1.4	1.4
M5	1.6	1.4	**4**	**4**	1	**3**	1.4	**3**	1.4	**3**	1.4	**4**	1.4	1.3	1.3
M6	1.7	1/5	1.2	**3**	1.3	1	1.5	1.4	1.4	1.4	1.6	**3**	1.2	1.2	1.3
M7	1.2	**3**	**3**	**4**	**4**	**5**	1	**5**	**2**	**3**	**2**	**5**	**3**	**4**	**3**
M8	1.6	1.4	1.3	1.2	1.3	**4**	1.5	1	1.3	1.3	1.6	1.2	1.3	1.3	1.5
M9	1.5	**2**	**3**	**5**	**4**	**4**	1.2	**3**	1	**4**	1.2	**4**	**5**	**3**	**2**
M10	1.6	**4**	**3**	**4**	1.3	**4**	1.3	**3**	1.4	1	1.4	**4**	**3**	1.3	1.4
M11	1.6	**4**	**4**	**5**	**4**	**6**	1.2	**6**	**2**	**4**	1	**4**	**5**	**3**	**3**
M12	1.6	**2**	1.3	**4**	1.4	1.3	1.5	**2**	1.4	1.4	1.4	1	**3**	**2**	1.2
M13	1.5	1.2	**3**	**3**	**4**	**2**	1.3	**3**	1.5	1.3	1.5	1.3	1	1.3	1.4
M14	1.4	**3**	**4**	**4**	**3**	**2**	1.4	**3**	1.3	**3**	1.3	1.2	**3**	1	1.3
M15	1.3	**5**	**5**	**4**	**3**	**3**	1.3	**5**	1.2	**4**	1.3	**2**	**4**	**3**	1

CR: 0.0523

Once the pairwise comparison matrices were formed and analyzed, relative weight and inconsistency rate (IR) of criteria and sub-criteria were calculated. For all matrices, IR < 0.1; this suggests that the matrices did not need to revise the judgments (Table 2-16).

Table 2: Pairwise comparisons matrix of options relative to the criterion 1

Changes in provisions and working level	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	4	1.2
Delays in commitments of the owner	1.4	1	1.4
Major discrepancies in the contract	2	4	1

CR: 0.046

Table 3: Pairwise comparisons matrix of options relative to the criterion 2

Overtime/under-time request	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	4	1.3
Delays in commitments of the owner	1.4	1	1.5
Major discrepancies in the contract	3	5	1

CR: 0.074

Table 4: Pairwise comparisons matrix of options relative to the criterion 3

Changes in delivery schedule	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	3	4
Delays in commitments of the owner	1.3	1	3
Major discrepancies in the contract	1.4	1.3	1

CR: 0.632

Table 5: Pairwise comparisons matrix of options relative to the criterion 4

Changes in project costs	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	4	1.3
Delays in commitments of the owner	1.4	1	5
Major discrepancies in the contract	3	5	1

CR: 0.074

Table 6: Pairwise comparisons matrix of options relative to the criterion 5

Effectiveness of the contract	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	3	2
Delays in commitments of the owner	1.3	1	1.3
Major discrepancies in the contract	1.2	3	1

CR: 0.044

Table 7: Pairwise comparisons matrix of options relative to the criterion 6

Elimination of obstacles and potential opponents	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	1.2	1.4
Delays in commitments of the owner	2	1	1.3
Major discrepancies in the contract	4	3	1

CR: 0.0142

Table 8: Pairwise comparisons matrix of options relative to the criterion 7

Necessary permits from the competent authorities	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	2	1.3
Delays in commitments of the owner	1.2	1	1.4
Major discrepancies in the contract	3	4	1

CR: 0.0142

Table 9: Pairwise comparisons matrix of options relative to the criterion 8

Insufficient attention to social and local conditions	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	1.2	1.4
Delays in commitments of the owner	2	1	1.5
Major discrepancies in the contract	4	5	1

CR: 0.075

Table 10: Pairwise comparisons matrix of options relative to the criterion 9

Ambiguity and contradiction in the contract	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	3	1.5
Delays in commitments of the owner	1.3	1	1.6
Major discrepancies in the contract	5	6	1

CR: 0.0775

Table 11: Pairwise comparisons matrix of options relative to the criterion 10

Delays in works	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	1.4	1.3
Delays in commitments of the owner	4	1	2
Major discrepancies in the contract	3	1.2	1

CR: 0.015

Table 12: Pairwise comparisons matrix of options relative to the criterion 11

Fundamental flaws and errors in design	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	2	1.5
Delays in commitments of the owner	1.2	1	1.6
Major discrepancies in the contract	5	6	1

CR: 0.023

Table 13: Pairwise comparisons matrix of options relative to the criterion 12

Quality of equipment and weather	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	1.3	1.5
Delays in commitments of the owner	3	1	1.4
Major discrepancies in the contract	5	4	1

CR: 0.069

Table 14: Pairwise comparisons matrix of options relative to the criterion 13

Changes in developmental policies	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	3	2
Delays in commitments of the owner	1.3	1	1.3
Major discrepancies in the contract	1.2	3	1

CR: 0.044

Table 15: Pairwise comparisons matrix of options relative to the criterion 14

Force majeure project	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	1.3	1.4
Delays in commitments of the owner	3	1	2
Major discrepancies in the contract	4	1.2	1

CR: 0.088

Table 16: Pairwise comparisons matrix of options relative to the criterion 15

Difficulty / complexity of the project	Changes in agreements	Delays in commitments of the owner	Major discrepancies in the contract
Changes in agreements	1	1.3	1.2
Delays in commitments of the owner	3	1	3
Major discrepancies in the contract	2	1.2	1

CR: 0.043

Table 17 reports the relative weights of options versus criteria. Table 18 shows the final weights of criteria. Frthermore, Fig. 3 shows the graphic presentation of the weights.

Considering the calculated weight of criteria listed in Table 18 as well as the relative weights of the options versus criteria shown in Table 17, the final weight of the options was calculated as follows:

For option 1 (Changes in agreements), the sum of final weight of the option A = 0.2566

For option 2 (Delays in commitments of the owner), the sum of final weight of the option B = 0.2165

For option 3 (Major discrepancies in the contract), the sum of final weight of the option C = 0.5269

Thus, the option 3 is the most important. Moreover, the four top important criteria include changes in provisions and working level, necessary permits, fundamental flaws and errors, ambiguity and contradiction in the contract, respectively.

Table 17: Relative weights of the options versus criteria

C	B	A	Criteria
0.545	0.11	0.345	M1
0.6192	0.0964	0.2844	M2
0.12	0.272	0.608	M3
0.602	0.12	0.278	M4
0.3336	0.1417	0.5247	M5
0.624	0.239	0.137	M6
0.624	0.137	0.239	M7
0.6767	0.1927	0.1306	M8
0.707	0.092	0.201	M9
0.3203	0.557	0.1227	M10
0.7227	0.1033	0.174	M11
0.6654	0.2308	0.1038	M12
0.3336	0.1417	0.5247	M13
0.36	0.512	0.128	M14
0.253	0.59	0.157	M15

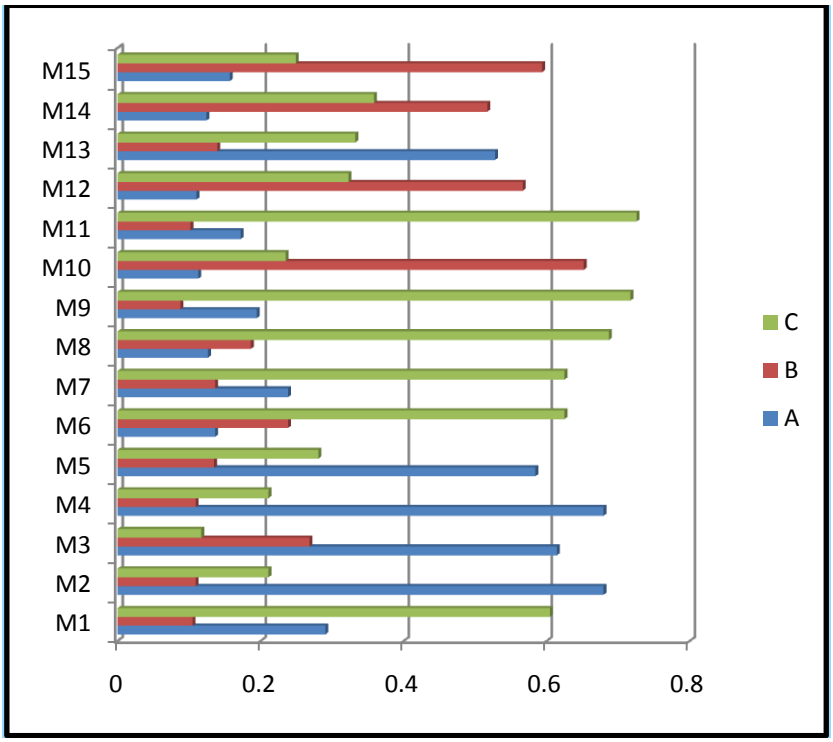

Figure 2. Relative weight of the options versus criteria

Table 18: Weight of criteria

Criterion	Result
Changes in provisions and working level	0.2099
Overtime/under-time request	0.0479
Changes in delivery schedule	0.0287
Changes in project costs	0.0148
Effectiveness of the contract	0.0455
Elimination of obstacles and potential opponents	0.0222
Necessary permits from the competent authorities	0.1245
Insufficient attention to social and local conditions	0.019
Ambiguity and contradiction in the contract	0.0945
Delays in works	0.0531
Fundamental flaws and errors in design	0.1197
Quality of equipment and weather	0.0357
Changes in developmental policies	0.0366
Force majeure project	0.0591
Difficulty / complexity of the project	0.089

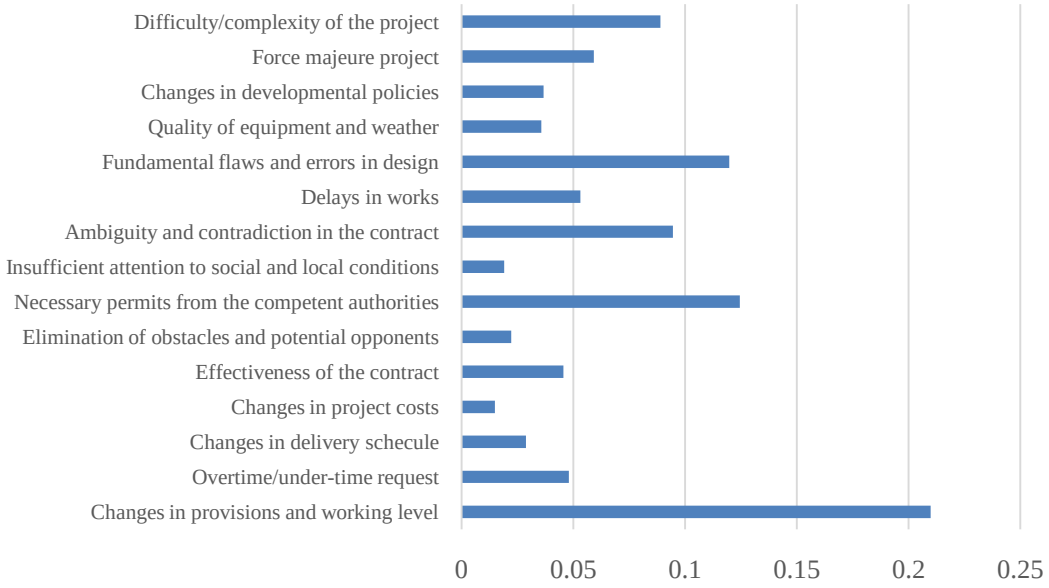

Figure 3. Weight of criteria

3. CONCLUSION

By field visits of development projects as well as internet and archival studies, additional questionnaires were distributed among 30 experts; the collected data was analyzed and prioritized by multi-criteria decision-making model (AHP). It was concluded that the option 'Major discrepancies in the contract' was the highest priority. Moreover, the criteria

'changes in provisions and working level' and 'fundamental flaws and errors in design' were the most important reasons of claims made by contractors in D-B-B projects. These reasons caused by 1) technical flaws in design, which are related to consultant engineers (in most projects, entities of the contracts are contractors and the owners; however, this study considered responsibilities of the consultant engineer included in the goals of the owner 2) legal flaws in the contract. In conclusion, a successful project is contracted by considering technical and legal terms and conditions (budget, inflation rate, etc). Entities of a proper contract are encouraged to work as a team with mutual, yet non-conflicting, interests and fair distribution of risk.

In Iran, responsibilities are mostly assigned to one single entity and the contracts are mostly in favor of the owners. The owners are authorized to accept or deny the claims of the contractors. Thus, owners prefer to use these authorities to reduce the costs of the project and usually ignore claims. Clearly, this will reduce the financial capabilities of the contactors and discourage standard performance. Moreover, the claims may lead to disputes between entities; these disputes may lead to early termination and extension of the delivery schedule.

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