



Decision Support System for Analyzing Key Performance Indicators in Construction Projects Management

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ABSTRACT

Many factors play a role in the life cycle of construction industry projects, focusing on human resources and relationships as the main axis of business development. Thus, the conflict of interests between the stakeholders in the construction industry projects is a clear and challenging problem. The increased number of stakeholders in the project complicates human relationships and, consequently, increases the possible conflicts. The conflicts may result in claims if not resolved. The success of construction projects and their cost and time management can be affected by the poor management of claims. Therefore, this research aims to take a significant step to improve the efficiency of projects by identifying and ranking the causes of claims and analyzing their effects on key efficiency indicators. Firstly, causes of claim are collected according to experts' opinions and literature and classified based on key efficiency indicators using the integrated analytic hierarchy process-technique for order preference by similarity to ideal solution (AHP-TOPSIS) technique. According to findings, delays with a proximity coefficient of 0.728 are the most significant factors in making claims with a great effect on the key efficiency indicators of the construction project. The changes in most construction projects are ranked in second place, followed by acceleration command, extra work, changing workshop conditions, and contractual ambiguities. The present study results may reduce the challenges in managing the construction industry claims and ensure the successful completion of projects.

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NOMENCLATURE

AHP	Analytic Hierarchy Process	PIS	Positive Ideal Solution
TOPSIS	Technique for Order of Preference by Similarity to Ideal Solution	NIS	Negative Ideal Solution
EPC	Engineering, procurement, and construction	KPIs	Key Performance Indicators

1. INTRODUCTION

The term 'claim' can be confusing and have several meanings. The following are two definitions of claims in the Cambridge English Dictionary: 1) To say that something is true or real, though you cannot prove it and people might not believe it, and 2) To ask for something valuable because you think it is yours or has a right to it.

As defined by the Project Management Institute, a party may submit a claim when it believes that the

counterparty should not be met the contractual obligation or expectations and is deserved to financial and time compensation [1]. In the Oxford Advanced Learner's Dictionary, claim means demanding something as right. In Webster Dictionary, the claim is defined as proving and demanding what is right or seems right. According to the Canadian Law Dictionary, a claim can be 'an assertion to the right to remedy, relief, or property or a 'failure to fulfill obligations under the contract' [2]. Other terms used for a claim are conflict and disputes. In

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the construction industry, claims are usually used to describe any request by the contractor for payments other than the contractual payments [3].

Conflict can be a factor in making a claim, and the dispute can be seen as the result. Disputes in the construction industry arise when claims can not be resolved, while claims arise because of mismanagement of conflicts [4]. Claims can be examined from two points of view, the party that submits the claim and the party that rejects or accepts the claim. What distinguishes claims from 'change' is the agreed element from both parties about what was promised. If the agreement is reached, the claim becomes a 'change'; otherwise, it becomes a 'dispute.' Conflicts in human relationships are unavoidable, so construction projects involving many factors can also occur. The more parties involved in a project, the more relationships, so there are more potential sources for conflict [5]. The use of the word 'claim' creates a kind of emotional confrontation usually accompanied by a charge and retaliation. The consequences of these claims are, in many cases, the disruption of relationships, arbitration, or litigation with all its delays and costs [6]. Claims are a major source of problems for the construction industry, and construction claims by any of the parties involved in the project are considered one of the most destructive and unpleasant events in a project [7]. In fact, claims are made when one party is harmed, and the other party has to make up for it [8]. More simply, a claim may be regarded as a claim for compensation for damages incurred by any party to the contract [2].

Due to the nature of the contracts, their complexity, the number of involved parties, risk, and pressure of time constraints in preparing contract documents, claims are unavoidable [4]. The claims are of concern to all parties involved in the construction project contract. Claims may result in increased costs and scheduling delays or jeopardize the working relationship between the parties involved in the contract. Claims and their causes are the main drivers of rising costs [9].

A survey conducted in western Canada showed that a large proportion of claims had been accompanied by delay and, in many cases delayed by more than 100% of the original contract period, as to the project cost, more than half of the claims resulted in an additional cost of at least 30% of their original contract value [2]. Other research work done in the United States and Thailand showed similar results: The average cost increase due to the claim is approximately 7% of the original contract price [10, 11].

In general, any construction contract is challenging because it seeks to provide a specific solution in violation of any terms or conditions. Therefore, it is essential for the parties involved in the contract to be well aware of its provisions [12].

Claims unknowingly consume project resources and are considered as one of the important reasons for project cost increases [13]. In fact, they divert resources away from project goals and thereby increase costs [14]. This may lead to project failure [15]. Completing projects without a claim is a key factor in the success of construction projects [16]. In fact, early identification of potential differences will help complete the project successfully [17].

In the construction industry, project managers must be able to make reliable predictions about the future status of the project. Such forecasts may help contractors control projects during the construction phase and give them early warning of potential problems. However, predicting performance is a complex and dynamic process involving many distinct indicators [18]. At the same time, changes in one performance index due to their very complex structures and interactions may affect other indicators [19]. Numerous other factors have an impact on these indicators and, ultimately, the overall performance of construction projects; one of them is the claims and their causes.

According to previous research, claims are unavoidable at various stages of the project. All efforts have been made to reduce claims, provide preventive solutions, and finally establish these claims, which is necessary to improve the performance of projects.

In fact, construction claims management is critical to success in executing construction projects. Research has also shown that poor claims management can affect the success of construction projects and their budgeting and scheduling. Despite the challenges of construction claims, different controls can be adopted to manage these claims to ensure that projects with minimal claim impact are implemented. In addition, claim control guarantees the successful completion of construction projects and minimizes delays and disputes [20].

The concept of project success is difficult to find because projects are complex and dynamic. The definition of this concept can vary depending on the type of industry, project team, or individual perspective [21]. An architect may evaluate success in aesthetic terms, and an engineer may be technically qualified, an accountant in terms of budgeted expenses, a human resources manager in terms of employee satisfaction, and an executive in terms of market shares [22]. In previous years, the simple definition of project success was based solely on project life cycle implementation stages. But it is now that project success needs to be defined from the beginning to the end of the project life cycle.

Their success can be evaluated and controlled through project efficiency measurement. Different techniques and approaches have been used in recent years to predict and evaluate the efficiency of construction, some of which are on the basis of key efficiency indicators. As can be

concluded from the review of previous research, the study of the causes of claims in construction projects from the key efficiency indicators' perspective has received less attention from researchers. Hence, integrating key efficiency indicators and determining their importance in construction projects is the first achievement of this paper, which has not been fully and comprehensively examined in other related studies. Examining the effect of claims on key efficiency indicators and, consequently, the construction project's success is the second achievement. According to different researches on the causes of claims and their resolution, a study that examines the effect of each reason on project efficiency was not observed in the literature.

Accordingly, in this study, the key efficiency indicators are ranked based on the causes of claims, following identifying the key efficiency indicators of construction projects and identifying the reasons for making claims using integrated AHP-TOPSIS and multi-criteria decision-making MCDM techniques. The association between the causes of claims and the key efficiency indicators helps project managers have a better view relative to the effect of their activities on the objectives and development of the project over time.

2. LITERATURE REVIEW

Projects completed in the construction industry receive different claims from stakeholders based on projects' specific conditions. These claims by project stakeholders significantly affect project efficiency and success [23].

In recent years, different definitions of the claim have been raised, but they all share the concept that a dispute arises between parties after a claim based on a rejected change [24-26]. Given the negative impact of possible claims on the ultimate goals and project success, more studies have been conducted on construction claims management in the past two decades [27-29]. One study conducted in 1993 showed that the causes of claims often include poor forecasting and review of workplace conditions, bidding with incomplete maps, early introduction of design reviews, and construction disturbance [30]. Half of the contractual claims are related to design errors [3]. Another study in Canada showed that the common causes of all claims are project acceleration, limited access, climate, and increased scope [4].

Likewise, studies have been conducted in different countries to examine the causes of claims, the types of claims, and the claims management process. One of these studies has been conducted in the UAE. The causes of claims concerning their priority include changes, extra-work, delays, different site conditions, acceleration, and contract ambiguity. In this research, the claims settlement methods were also examined and classified according to

the priority used in the projects (negotiation, mediation, arbitration, and litigation) [31].

Most research has focused on two factors, delay, and change, which are the main drivers of claims in construction projects. According to a study in the state of Colorado, the delay is the main reason behind claims in the projects under consideration, and even more important than change and additional orders. It also proves that projects with fixed completion dates are more susceptible to claims than projects with more flexible planning [9]. Further research has also been done to prove that changes in employers' requirements are the most important reason for making a claim [32].

Since claim management is a process that requires analyzing a large amount of diverse information, old documentation methods developed by industry experts can be considered as one of the most important challenges for successful claims management. The feasibility of existing claim management systems is questionable due to problems with input and document information. For this reason, a study has been conducted to develop a BIM-based claim management system [13].

In a study aimed by Bakhary et al. [33] at categorizing the claim management process-related problems from the contractors' and consultants' viewpoints, classified conventional claim management procedures into six main stages, including identification, notification, examination, documentation, presentation, and negotiation. The findings of this study emphasize the need for a proper documentation and recording system with qualified staff to identify the claims during the project. Researchers also state that a standard and transparent procedure needs to be established by which contractors can make the right claim by following it.

Construction claims are now an unavoidable concern and have a major impact on project efficiency. The timely completion of construction projects is an important criterion for measuring project success. However, most construction projects are delayed due to problems with claims and their management, which will have a negative impact on project efficiency. Claims also have a significant impact on the cost of construction projects and cause negative cost performance [34]. A study has also been conducted to enhance understanding of the relationship between conflict management, team coordination, and project efficiency [35].

In another study [36] project claim management has been investigated to minimize project cost and time functions using a meta-heuristic algorithm with the EPC project as a case study. The experimental results demonstrate the minimum time and delay of the project with better stability and effectiveness of the system.

Since 1980, more emphasis has been placed on non-financial and multidimensional performance indicators to understand better and manage construction projects' performance [37, 38].

Asgari et al. [39] have examined the key success factors in the construction industry from the owners, contractors, and consultants' point of view. They classified the identified indicators into five main categories, including financial, interactive processes, human resources, contract agreements, and project specifications. Their results showed that the human resources group-related indicators from the owners' and contractors' point of view and financial and project specifications-related indicators from the consultants' point of view are the main features for project success [39]. In 2009, the effect of rework on project efficiency was evaluated both in terms of employer and contractor [40]. In 2016, another researcher evaluated and modeled the competence of construction projects and their relationships to project efficiency [41]. In the next study, the system dynamics approach was used to model the relationship between tender strategy and construction project efficiency [42]. In the same year, a model was presented for predicting the performance of construction projects to manage the performance of construction projects with a system dynamic approach [18]. In recent years, many studies have been complete in the field of performance management, key performance indicators, and different performance management systems in different countries [43-46].

2. 1. CAUSES of CLAIM According to the literature review of claims in the construction projects, there are several reasons for making claims, the most important of which were considered to determine their impact on the performance of construction projects in this study, changes, delays, acceleration, extra work due to change commands, different site conditions, and contract ambiguity.

2. 1. 1. Changes The complexity and uniqueness of construction projects and the involvement of different individuals and stakeholders in these projects are characteristic of these projects. In fact, these features result in changes. Changes in construction projects are common and appear to be the main source of conflict but are sometimes required to complete the project. From the perspective of the employer or the main contractor, the changes are undesirable because some of them have indirect effects on the cost and schedule of the project [47]. Changes should not include removing something intended to be done by others. Claims for changes made while executing a project are inevitable because all possible states cannot be predicted. The main source of dispute is what changes are and are not. Any change from the specified sequence or timing stated in a program submitted by the contractor and instructed by the engineer would therefore qualify as a change. The employer is not permitted to make changes without giving instructions, and these instructions must be in

written form. We should know that extra work does not mean change because extra work is not in the contract, but change means changing what was in the contract and done before. Changes can occur at any stage, including design, specifications, and implementation. A change announcement can be written or structured; a structured announcement means making the change and reacting immediately [48].

2. 1. 2. Delays Claims due to delays in the construction industry are among the most common types of claims. This claim relates to a period of time when construction is prolonged or activities are not performed as expected and are not in agreement with the parties. The delay must be justified to provide a basis for the cost or additional payment. However, types of justifiable delays occur once in a contract and naturally relate to events beyond the control of the contract [49]. To complete the project within the designated time, the contractor and the employer must make every effort. Failure in this area will create a claim and eventually a dispute.

But in most cases, 'extension of time' is considered a need for the project, and in fact, the extension of time is 'money,' and the same claim for compensation by each factor causes a great deal of conflict and dispute [48]. Employer delays are one of the most important issues for contractor claims, and contractors can raise claims by documenting claims that, in most cases, result in employer financial and non-financial compensation. Employer delays include delays in delivery of the site, suspensions, delays in delivering documents, delays in payments, and so on.

2. 1. 3. Acceleration Construction contracts clearly consider important milestone times, completion date together with probably liquidated damages for delay or additions for completing on time. Thus time is a key factor in project decisions. Speeding up arises when the work of the contractor is accelerated to finish a specific task earlier than the designated time. Acceleration in construction projects is classified into two types: directed acceleration and constructive acceleration [50]. To compensate for lost time, most employers order contractors to speed up work. To achieve this goal, more resources may be employed, which is inconsistent with productivity and the planned linear performance and can be costly [48]. In fact, another reason for the claim is an acceleration order by the employer, and because it is unforeseen, it will impose additional costs on the contractor and is, therefore, one of the foundations of the claim. Accelerated costs include additional labor costs, overtime costs, additional equipment costs, stacking of trade costs, increased overhead costs, loss of labor efficiency costs, additional supervision costs, increased material delivery costs, and so on [48].

2. 1. 4. Extra Work Due to Change Commands

Any changes to the project will cause extra work. But there is a difference between overtime and extra work. Because extra work is freelance and off-contract, overtime is for the full realization of the contract terms. One of the inevitable cases of project implementation is the change in the technical specifications and the order of change in the execution of works for various reasons. One of the inevitable cases of project implementation is the change in technical specifications and execution of works for various reasons. These changes cause extra work on the project, including change orders according to the employer’s opinion, changes due to inevitable and executive reasons, deficiencies in technical specifications and schedules, confusion in technical specifications, lack of transparency in decisions, and previous executive measures [48].

2. 1. 5. Different Site Conditions Claims due to different site conditions after the contract are one of the common claims, and these changes may occur during soil testing and drilling of boreholes, excavation, leveling, or construction of buildings and installations. Changing workplace conditions may increase the cost of implementation, an unpredictable delay, the need to employ sophisticated technical practices, and ultimately disrupt the normal operation of the project. If, in the condition of a tender or before the contract, the contractor is required to visit the site and then submit an offer, then it will be extremely difficult for the contractor to submit a claim on the condition of the site. If the contractor is not fully aware of the environmental conditions of the workshop or somehow hidden from the contractor’s view, in this case, secrecy may cause the contractor to make a claim, even in court [47].

2. 1. 6.Contract Ambiguity Mistakes in the preparation of documents as well as bid-offer are a fairly common topic. Mistakes can take many forms. Common mistakes include computational or written errors, deletion of some rows, mistaken assumptions, different or inaccurate understanding of concepts, and dual interpretation. Other types of errors are related to the contractor’s viewpoint in setting and bidding. These errors include estimation with an error about the project completion time or workforce or materials and equipment. Mistakes due to ignoring facts or legal matters or the essential requirements of the contract do not normally have no way of getting rid of the legal consequences [48].

2. 2. Analytical Hierarchy Process Method (AHP)
Analytical Hierarchy Process is one of the most widely used Multiple Criteria Decision Making methods,

developed by Saaty [51]. The principles of the AHP process are:

- The reverse condition
- The principle of homogeneity
- The principle of dependency
- The principle of expectations
- This method can do two things: find the relative importance of the indexes and rank the options.

2. 2. 1. Steps of the Analytical Hierarchy Process Method

Step 1: First, a logical pairwise comparison matrix is created using a scale ranging from 1-9. The scale (1-9) is shown in Table 1. The number of pairwise comparisons is calculated using Equation (1).

$$number\ of\ Pairwise = \binom{n}{2} \tag{1}$$

where n is the number of factors.

Step 2: Normalizing the Matrix Values Pairwise Comparisons. To do this, we divide the values of each matrix component into the sum of the column components containing the same component.

Step 3: Calculating the relative importance of each index. The arithmetic mean of each row is the relative importance of each index.

Step 4: Determining the incompatibility rate. If the rate is greater than 0.1, the comparisons should be revised; otherwise, there is compatibility, and work can continue.

2. 3. TOPSIS¹ Method The TOPSIS method is another multi-criteria decision-making method used by Hwang et al. [40]. In this research, this method was used in combination with the AHP method. The basic concept of this method is that the chosen option should be the shortest distance from the best possible and the longest distance from the worst possible [52, 53].

2. 3. 1. Steps of TOPSIS Method 1) Determining the decision matrix. Given a set of alternatives, $A = \{A_k \mid k = 1, \dots, m\}$ [7], and a set of criteria, $C = \{C_j \mid j = 1, \dots, n\}$, where $X = \{x_{kj} \mid k = 1, \dots, m; j = 1, \dots, n\}$ denotes the set of performance ratings and $w = \{w_j \mid j = 1, \dots, n\}$ is a set of

TABLE 1. Scale (1-9) [51]

Definition	Standard values	Inverse values
The same importance	1	1/1
Weak dominance	3	1/3
Strong dominance	5	1/5
Very strong dominance	7	1/7
Absolute dominance	9	1/9
Inter values	2,4,6,8	1/2,1/4,1/6,1/8

¹ Technique for Order Preference by Similarity to ideal Solution

weights as follows:

$$W = [w_1 \quad w_2 \quad \dots \quad w_n] \tag{2}$$

(2) Calculating the normalized decision matrix. The normalized value r_{ij} is calculated as follows:

$$R = \begin{bmatrix} r_{11} & \dots & r_{1n} \\ \vdots & \dots & \vdots \\ r_{m1} & \dots & r_{mn} \end{bmatrix} \tag{3}$$

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \tag{4}$$

(3) Calculating the weighted normalized decision matrix. The weighted normalized value v_{ij} is calculated as follows:

$$v_{ij} = w_j * r_{ij} \quad , \quad \begin{matrix} i = 1, 2, \dots, m \\ j = 1, 2, \dots, n \end{matrix} \tag{5}$$

where w_j is the weight of the i^{th} attribute or criterion, and $\sum_{j=1}^n w_j = 1$.

(4) Determining the positive ideal solution (PIS) and negative ideal solution (NIS):

$$A^+ = \{v_1^+, \dots, v_j^+, \dots, v_n^+\} = \{(\max_j v_{ij} | i \in I), (\min_j v_{ij} | i \in J)\} \tag{6}$$

$$A^- = \{v_1^-, \dots, v_j^-, \dots, v_n^-\} = \{(\min_j v_{ij} | i \in I), (\max_j v_{ij} | i \in J)\} \tag{7}$$

where I is associated with benefit criteria, and J is associated with cost criteria.

(5) Calculating the separation measures using the n -dimensional Euclidean distance. The separation of each alternative from the ideal solution is given by:

$$S_i^+ = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^+)^2} \tag{8}$$

$$S_i^- = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^-)^2} \tag{9}$$

(6) Calculating the relative closeness to the ideal solution. The relative closeness of the alternative A_i with respect to A^+ is defined as follows:

$$C_i = \frac{S_i^-}{S_i^- + S_i^+} \tag{10}$$

Finally, the preferred orders can be obtained according to the similarities to PIS (C_i) in descending order to choose the best alternatives

3. RESEARCH METHODOLOGY

According to the literature review, 42 key performance indicators were obtained, the number of these indices

reached 22 by the Delphi method with a statistical population consisting of 10 experts. All steps performed in this study are shown in Figure 1.

A total of 24 indicators were assessed by distributing the questionnaire based on the Likert scale between experts. Cronbach's alpha was used to measure the internal consistency of the questionnaire and, in fact, its reliability. Cronbach's alpha is obtained at 0.83, which is good according to Table 2. At this stage, 130 questionnaires were distributed and ranked according to Table 3 to select the most important indicators.

TABLE 2. Cronbach's alpha values [54]

Reliability	Cronbach's alpha coefficients
Excellent	$\alpha \geq 0.9$
Good	$0.8 \leq \alpha \leq 0.9$
Acceptable	$0.7 \leq \alpha \leq 0.8$
Questioned	$0.6 \leq \alpha \leq 0.7$
Poor	$0.5 \leq \alpha \leq 0.6$
unacceptable	$\alpha \leq 0.5$

TABLE 3. Selection of the most important key performance indicators

KPIs	Mean Index	Rank
Cost	4.289	1
Schedule	4.273	2
Safety	4.260	3
Quality	4.242	4
Environment	4.210	5
Client satisfaction	4.202	6
Team satisfaction	4.192	7
Profitability	4.172	8
Productivity	4.140	9
Sustainability	4.120	10
Stakeholder satisfaction	4.111	11
Integration	4.091	12
User expectation and satisfaction	4.091	13
Communication	4.061	14
Functionality	4.050	15
Risk	4.040	16
Billing	4.020	17
Procurement	4.020	18
Technical performance	4.010	18
Supply chain	4.000	19
Scope	3.990	20
Innovation	3.959	21

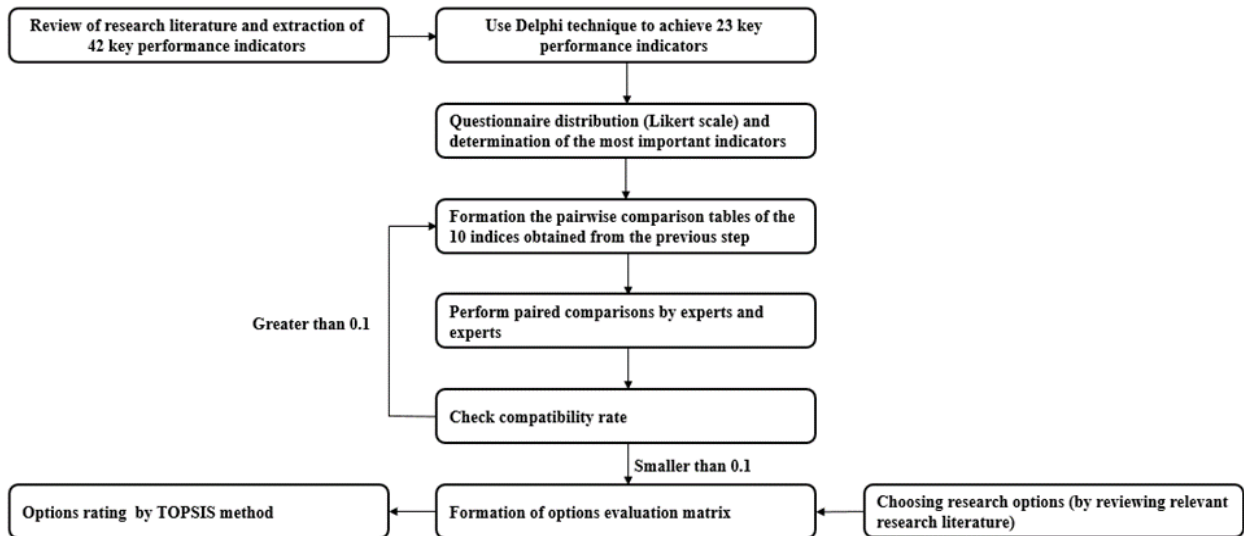


Figure 1. Diagram of Research Methodology

Ranking Key Performance Indicators Based on The Causes of Claims

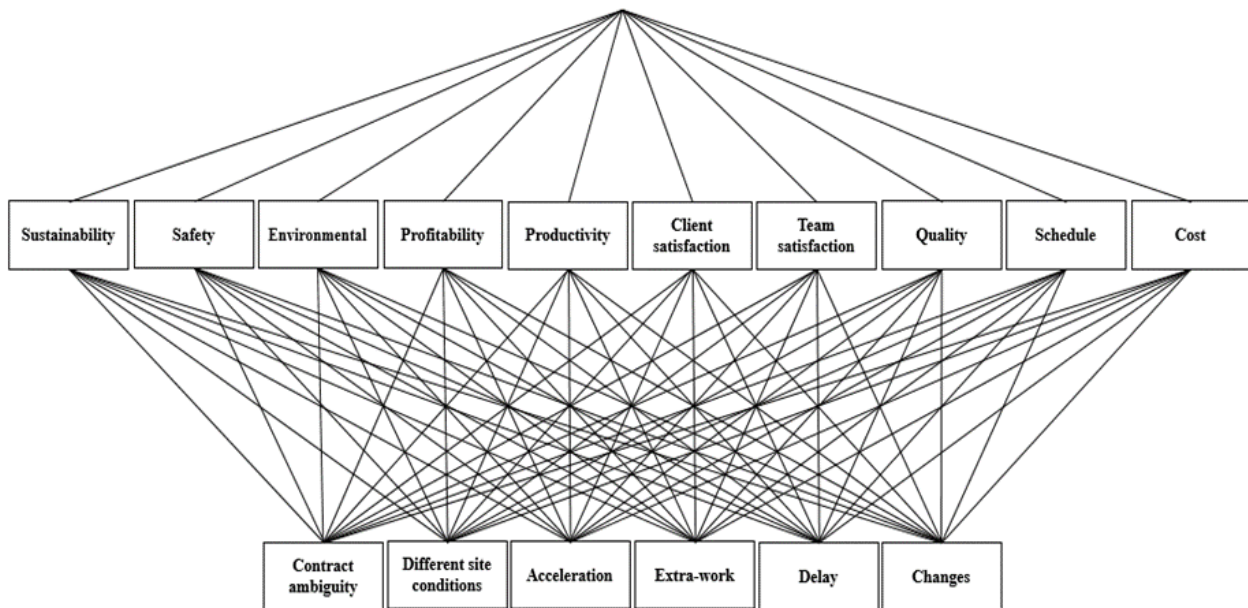


Figure 2. Research hierarchy model

4. RESULTS

In this study, due to a large number of options and factors resulting in increased pairwise comparisons, a hybrid approach was used to ensure accuracy. The relative importance of the indicators was determined by the AHP method and the ranking of options by the TOPSIS method. In fact, using the hybrid method reduces the number of computations and even comparisons by at least half, which is an acceptable and

reasonable solution besides accurately calculating and computing results. Quantitative and qualitative criteria can also be involved in the evaluation at the same time. The ranking hierarchy for the research is shown in Figure 3.

We examined the performance indicators of scheduling, safety, cost, customer satisfaction, quality, team satisfaction, profitability, productivity, sustainability, and the environment, among the questionnaire’s first 10 performance indicators.

Thus, 10 factors obtained from the analysis of the questionnaire results were ranked by the AHP method, and each weight was determined as required by the TOPSIS method. Since the software incompatibility rate is 0.03, then the compatibility is found in paired comparisons, and the results can be trusted. The ratings and weights of the AHP are summarized in Table 4.

The options were then ranked by the TOPSIS method, and the results from the analysis of the answers are listed in Table 5.

TABLE 4. Relative importance of key performance indicators

KPIs	Wi	Rank
Safety	0.212	1
Environmental	0.107	2
Cost	0.101	3
Profitability	0.094	4
Schedule	0.093	5
Productivity	0.092	6
Sustainability	0.082	7
Quality	0.082	7
Client satisfaction	0.076	8
Team satisfaction	0.063	9

TABLE 5. Ranking the causes of claim

Causes of claim	Pi	Rank
Delays	0.728	1
Changes	0.640	2
Acceleration	0.632	3
Extra work	0.519	4
Different site conditions	0.493	5
Contract ambiguity	0.114	6

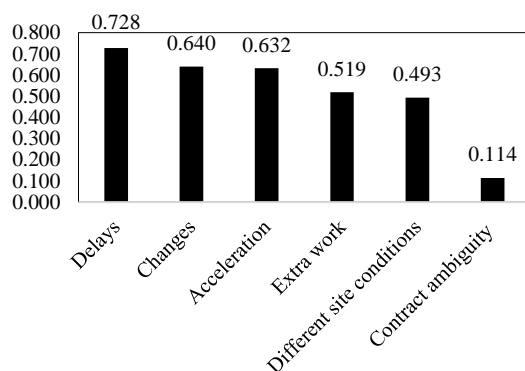


Figure 3. Comparative graph of the proximity coefficients of options

5. DISCUSSION AND CONCLUSIONS

According to the relevant literature review results, it can be said that claims occur in most construction projects. But most of these claims are not treated correctly. A lot of research has been done in this field in different countries. Every year a lot of time and money is spent around the world settling construction claims. Therefore, it is crucial to use a correct management process to reduce the claims to resolve the problems. The claim management process involves a number of steps useful to improve project efficiency if performed correctly and accurately by experts. Claims have a major impact on the performance of construction projects and their success or failure. Construction projects and their related contracts are a large and complex collection of documents. Often these documents are not properly understood by various factors involved in the project or each with a different interpretation of the contract clauses, leading to a conflict. If these claims are not resolved correctly, they will cause disputes in construction projects. For this reason, having a good documentation system has become an essential requirement in resolving claims. In fact, this documentation system will assist the claim management process to prevent disputes. For correctly claim management, time, cost, and an expert workforce trained in the proper use of the documentation and reporting system are required. If all are followed, an effective step will be taken to improve project efficiency in all areas.

According to the results, the reasons for making claims in construction projects in Iran are delays, changes, acceleration, extra-work, different site conditions, and contract ambiguity. The key performance indicators used in this ranking, in order of priority, include safety, environment, cost, profitability, scheduling, productivity, sustainability, quality, customer satisfaction, and team satisfaction.

Delays with a proximity factor of 0.728 are the most important cause of claims that significantly impact key performance indicators of the project. Changes also occur in most construction projects, with a coefficient of 0.640 seconds. Then, acceleration, extra-work, different site conditions, and contract ambiguity with coefficients of 0.632, 0.519, 0.493, and .114 are placed in the next priorities, respectively. As such, the importance of having a documentation and reporting system in projects is clear. It needs serious scrutiny. Training team members and project staff about the requirements of contract clauses and clearly defining the purpose of contract clauses are essential steps in construction projects. This can partially help to partially alleviate and resolve claims to improve performance and minimize disagreements.

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Persian Abstract

چکیده

در چرخه حیات پروژه‌های صنعت ساخت، عوامل بسیاری نقش دارند که منابع و روابط انسانی محور اصلی پیشرفت فعالیت هاست. بنابراین تضاد منافع بین ذینفعان در پروژه های این صنعت مساله ای بدیهی و چالش برانگیز است. افزایش تعداد ذینفعان در پروژه، موجب پیچیدگی روابط انسانی و در نتیجه سیر صعودی احتمال تعارضات می شود. این تعارضات در صورت عدم حل و فصل می تواند منجر به ایجاد ادعا خواهند شد. مدیریت ضعیف دعاوی بر موفقیت پروژه‌های عمرانی و مدیریت هزینه و زمان آنها تأثیرگذار است. از این رو هدف از انجام این تحقیق آن است تا با شناسایی و رتبه‌بندی علل ایجاد دعاوی و تحلیل اثرات آنها بر شاخص‌های کلیدی عملکرد، گامی جهت بهبود عملکرد پروژه‌ها برداشته شود. در ابتدا دلایل ایجاد ادعا طبق نظر خبرگان و ادبیات پژوهش جمع‌آوری گردیده و براساس شاخص‌های کلیدی عملکرد و با روش ترکیبی AHP-TOPSIS رتبه‌بندی شده است. یافته ها نشان داد که تأخیرات با ضریب نزدیکی ۰.۷۲۸ مهمترین عامل ایجاد ادعاها هستند که تأثیر زیادی بر شاخص‌های کلیدی عملکرد پروژه دارند. تغییرات هم که در اغلب پروژه‌های عمرانی ایجاد می‌شوند، در رتبه دوم قرار دارند. سپس دستور تسریع، کار اضافی، تغییر شرایط کارگاهی، و ابهامات قراردادی در اولویت‌های بعدی قرار دارند. نتایج این تحقیق می‌تواند چالش‌های موجود در مدیریت دعاوی صنعت ساخت‌وساز را کاهش داده و اتمام موفقیت‌آمیز پروژه‌ها را تضمین کند.
