

Analysis of the Factors Causing Disputes in Construction Projects using One -Way Anova

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Abstract: Due to overgrowing demands and change in the work policy disputes have started arising a lot in construction industry to avoid all this its necessary to take some relative factors in to consent. Thus this study aims to analyse the factors which cause disputes in the Indian construction sector. Where conflicts is defined as ‘indispensable as peace, since the only reason for seeking peace is because there exit's conflict, which is inevitable in the construction industry as in any human endeavour’. Accordingly the conflict arising in the client, contractor, and consultant is studied and the reason of disputes are found .In order to reach these objectives a literature survey was carried out to determine the cause of constructional disputes .The response analysis will be carried out with the help of statistical method to determine the cause of disputes according to their importance.

Keywords: Contractor, client, disputes, conflicts, critical factors

INTRODUCTION

The construction industry plays an important role in the development and growth of the nation .It plays a crucial role in the economical growth of the country .It helps in the urbanization of the rural parts of the country. Hence the process of modernization requires implementation of new methods and techniques which ultimately turns out to be more and more complex and leads in the evolvement of several ideas among the various participants in the industry which ultimately gives rise to various conflicts and disputes in the constructional projects .The construction sector is a compound sector in which client , consultant, contractor with various views, talents and levels of knowledge of the construction process work together. In this sector the client , contractor ,consultant from various parts have their own goal to get maximum output . Construction disputes may generally happen often during every construction project and could take place at any time during the design and construction phase of the project. It is necessary to know the causes of dispute in the field, to avoid delays since majority of the money is locked in the construction sector to avoid these reasons one should know the reasons of dispute happening on the field and between the client, contractor , consultant. However there is an uncertainty between the dispute and conflict between the people of the sector. Conflict and dispute are two distinct notations. Conflict exists wherever there is differences in opinions. Conflict can be coped , possibly to the extent of preventing a dispute arising from the conflict. On the other side disputes are one of the major factors that delay the successfully progress/completion of the construction project.

2 LITERATURE REVIEW

Junying Liu, et al, (2018),” Experience mining based on case-based reasoning for dispute settlement of international construction projects” Considering the experience-orientation of the construction industry, the priceless experience of similar historical cases is important help to resolve new problems, while research concerning this issue in dispute settlement is still relatively scarce. The objectives of this study are to (1) propose a pragmatic method for generating dispute settlement for international construction projects based on Case-Based Reasoning (CBR); and (2) validate the CBR model by a specific dispute case. To achieve the research objectives the successful historical cases are selected collected, and attributes that influence dispute related problems are derived in the similar cases

Karthikeyan, et al, (2017), in “a study on causes and effects of conflicts in Indian construction projects” describes that there are various reasons that how the conflict or dispute arises in the construction sector. Author describes the type of conflicts like emotional, task, due to break of contract terms. The author has used the questionnaire survey to minimize the conflicts and its effect upon the industry, also describes that these study can help the manager's as the guidelines for taking action will managing their projects. This paper has given the conceptual model for minimizing the conflict similarly empirical studies can be done to find reasons for conflicts and disputes based on the primary data

Sagar soni, et al, (2017), in “conflicts and disputes in construction project: An overview”. The author says that, disputes or conflicts cannot be finished off completely but can be minimized taking the factors responsible for the arguments. The factors that cause conflict are like that owner related, contractor related, consultant related, third party and human behaviour related, design and contract related should be taken into considerations while managing the disputes.

Simon Grant, et al ,(2014)“A matter of interpretation: liquidated damages and ambiguous contracts ”.The author explains the damages with the help of mathematical solutions of differentiation, framework developed suggests the possibility of an endogenous choice between contracts over different characteristics, where the choice contractual variables depends upon the documents the level of ambiguity and potential gains from risk sharing

Rizwan U. Farooqui ,et.al, (2014) “Key Causes of Disputes in the Pakistani Construction Industry– Assessment of Trends from the Viewpoint of Contractors” describes that several types of disputes arises due different types of claims, and cause of dispute in terms of frequency of occurrence and severity if it occurs.

Sigitas Mitkusa, et.al , (2013) “Causes of Conflicts in a Construction Industry: A Communicational Approach” describes that many of the times the reason of conflict resulting to dispute is unsuccessful If the conflict is not controlled or managed on proper time then it also leads to unfair behaviour of parties and psychological defence mechanism.

N. Jaffar et.al, (2011), “Factors Of Conflict In Construction Industry: A Literature Review” describes that conflicts can be interpreted a disagreement between two or more members of organizations or groups in the organization that arise because they have to use scarce resources , or carry out activities together, or have the status, goals, values, and perceptions is different. Author describes three important points in which conflicts can be categorized- behavioural conflict, contractual conflict, technical conflict.

Sources of disputes

| | |
|---------------------------|--|
| Design related | Incomplete specifications and design errors Quality of design and availability of information |
| Owner related | Design variations initiated by owner |
| | Payment delay |
| | Late possession |
| | Quality of work |
| | Unrealistic expectation |
| | Change of scope |
| Contract related | Ambiguities in the contract documents |
| | Different interpretations of the contract provisions |
| | Risk allocation |
| | Other contractual problems |
| Contractor related | Time extension |
| | Lack communication |
| | Technical inadequacy of the contractor |
| | Delay in work progress |
| | Financial failure of the contract |

DATA ANALYSIS

Thus for the collected data its necessary to be analyzed for the further study we will be using one way anova test for the calculation and finding the critical factors affecting the Indian construction industry.

One –way anova

One way anova technique is used to compare means of three or more samples using f distribution. This technique can be used only for numerical data .The anova tests the null hypothesis that samples in two or more groups are drawn from populations with the same mean values .to do this estimates are made of the population variance .These estimates rely on various assumptions .The anova produces an f- statistic, the ratio of the variances calculated among the means to the variances within the samples. If the group means are drawn from populations with the same mean values, the variance between the group means should be lower than the variance of the samples, following the central limit theorem .A higher ratio therefore impels that the samples were drawn from populations with different mean values, however the one- way anova is used to test for differences among at least three groups , since the two group case can be covered by a t-test

Hypothesis

Responses were distributed among participants in construction industry and consistency among the data is checked. In order to fulfil the objective, the null and alternative hypothesis for examining the difference in opinions of the construction professionals as follows:

Null Hypothesis (Ho) - no significant difference among the construction professionals in opinion for disputes factors.

Alternate Hypothesis (Ha) - significant difference among construction professionals in opinion for dispute factors.

Table no 1. Organization Vs Different interpretations of contract provisions

ANOVA

| Source of variation | SS | DF | MS | F | P –value | F- critical |
|---------------------|----------|-----|----------|----------|----------|-------------|
| Between groups | 255.2083 | 1 | 255.2083 | 43.30645 | 1.35 | 3.921478 |
| Within groups | 695.3833 | 118 | 5.893079 | | | |
| Total | 950.5917 | 119 | | | | |

The above table shows that F value is greater than the F critical so the assumed null hypothesis is wrong therefore the alternative hypothesis should be assumed for the further calculation

Table no 2. Organization Vs Delay in progress of work

| Source of variation | SS | DF | MS | F | P-value | F-critical |
|---------------------|----------|-----|----------|----------|---------|------------|
| Between groups | 353.6333 | 1 | 353.6333 | 15.65082 | 0.00013 | 3.921478 |
| Within groups | 2666.233 | 118 | 22.5952 | | | |
| Total | 3019.867 | 119 | | | | |

The above table shows that F value is greater than the F critical so the assumed null hypothesis is wrong therefore the alternative hypothesis should be assumed for the further calculation

Table no.3 Organization Vs Risk allocation

| Source of variation | SS | DF | MS | F | P-value | F-critical |
|---------------------|----------|-----|---------|----------|---------|------------|
| Between groups | 357.075 | 1 | 357.075 | 45.30385 | 6.44 | 3.921478 |
| Within groups | 930.05 | 118 | 7.88178 | | | |
| Total | 1287.125 | 119 | | | | |

The above table shows that F value is greater than the F critical so the assumed null hypothesis is wrong therefore the alternative hypothesis should be assumed for the further calculation

Table no.4 Organization Vs Quality of work

| Source of variation | SS | DF | MS | F | P-value | F-critical |
|---------------------|-------|-----|----------|---------|----------|------------|
| Between groups | 24.3 | 1 | 24.3 | 3.44267 | 0.066028 | 3.921478 |
| Within groups | 832.9 | 118 | 7.058475 | | | |
| Total | 857.2 | 119 | | | | |

The above table shows that F value is less than the F critical thus the assumed null hypothesis is right which shows that the assumed factor based upon the F values gives us the critical factor that affects the Nashik construction industry

Table no.4.Organization Vs change of scope

| Source variation | SS | DF | MS | F | P-value | F-critical |
|------------------|----------|-----|----------|----------|----------|------------|
| Between groups | 26.13333 | 1 | 26.13333 | 2.435359 | 0.121305 | 3.921478 |
| Within groups | 1266.233 | 118 | 10.73079 | | | |
| Total | 1292.367 | 119 | | | | |

The above table shows that F value is less than the F critical thus the assumed null hypothesis is right which shows that the assumed factor based upon the F values gives us the critical factor that affects the Nashik construction industry

Table no 5 .Experience Vs Design variation initiated by owner

| Sourceof variation | SS | DF | MS | F | P-value | F-critical |
|--------------------|--------|-----|----------|---------|---------|------------|
| Between groups | 1825.2 | 1 | 1825.2 | 1.15413 | 3.44 | 3.921478 |
| Within groups | 1866.1 | 118 | 15.81441 | | | |
| Total | 3691.3 | 119 | | | | |

The above table shows that F value is less than the F critical thus the assumed null hypothesis is right which shows that the assumed factor based upon the F values gives us the critical factor that affects the Nashik construction industry

Table no. 6 Organization, Experience Vs design variation initiated by owner

| Source of variation | SS | DF | MS | F | P-value | F-critical |
|---------------------|---------|-----|----------|----------|---------|------------|
| Between groups | 2036.8 | 2 | 1018.4 | 83.53924 | 2.83 | 3.047012 |
| Within groups | 2157.75 | 177 | 12.19068 | | | |
| Total | 4194.55 | 179 | | | | |

The above table shows that F value is greater than the F critical so the assumed null hypothesis is wrong therefore the alternative hypothesis should be assumed for the further calculation

Table no 7. Experience Vs lack of communication

| Sourceof variation | SS | DF | MS | F | P-value | F-critical |
|--------------------|----------|-----|----------|----------|---------|------------|
| Between groups | 2279.408 | 1 | 2279.408 | 127.5839 | 1.69 | 3.921478 |
| Within groups | 2108.183 | 118 | 17.86596 | | | |
| Total | 4387.592 | 119 | | | | |

the above table shows that F value is greater than the F critical so the assumed null hypothesis is wrong therefore the alternative hypothesis should be assumed for the further calculation

Table no 8. Organization , Experience Vs Change of scope

| Sourceof variation | SS | DF | MS | F | P-value | F-critical |
|--------------------|----------|-----|----------|----------|---------|------------|
| Between groups | 1803.911 | 1 | 901.9556 | 119.0427 | 1.74 | 3.047012 |
| Within groups | 1341.803 | 177 | 7.576742 | | | |
| Total | 3144.994 | 179 | | | | |

The above table shows that F value is greater than the F critical so the assumed null hypothesis is wrong therefore the alternative hypothesis should be assumed for the further calculation

Table no. 9 Organization , Experience Vs Time extension

| Source of variation | SS | DF | MS | F | P-value | F-critical |
|---------------------|----------|-----|----------|----------|---------|------------|
| Between groups | 1803.911 | 2 | 901.9556 | 80.18054 | 1.62 | 3.047012 |
| Within groups | 1991.083 | 177 | 11.24906 | | | |
| Total | 3794.994 | 179 | | | | |

The above table shows that F value is greater than the F critical so the assumed null hypothesis is wrong therefore the alternative hypothesis should be assumed for the further calculation

Table no. 10 Organization , Experience Vs Quality of work

| Source of variation | SS | DF | MS | F | P-value | F-critical |
|---------------------|---------|-----|----------|--------|---------|------------|
| Between groups | 1346.8 | 2 | 673.4 | 131.30 | 1.08 | 3.047012 |
| Within groups | 907.75 | 177 | 11.24906 | | | |
| Total | 2254.55 | 179 | 5.1285 | | | |

The above table shows that F value is greater than the F critical so the assumed null hypothesis is wrong therefore the alternative hypothesis should be assumed for the further calculation

INFERENCES

The results of ANOVA shows that for “Organization vs. Factors causing disputes” conclude that “Financial failure of the contractor”, “Time extension”, “Quality of work” and “Change of scope” are the critical factors causing disputes in construction industry.

RESULT AND DISCUSSION

As the data is analyzed with the range of experience is to be taken into consideration, Most of the respondents are from 0-3 years. This helps to understand about the impact of the factors on Fresher's. It is observed from the above tables that there is significant impact on 3 factors based on the Range of experience. They are: “Technical inadequacy of the contractor”, “Quality of work”, “Quality of Design and availability of Information”. But the employees with experience less than 3 years for the factor “Technical inadequacy of the contractor” & “Quality of Design and availability of information”, being critical for causing disputes, whereas employees with experience 9 years more accept that Technical inadequacy of the contractor is critical factor. The f value shows that employees from all age group agree that “Quality of work”, “Quality of Design and availability of information” are significant for causing disputes in construction industry.

As the data is analyzed with the Type of organization is taken into consideration, Most of the respondents are from clients. This helps to understand about the impact of the factors are from client which say “Delay in work progress”, critical

CONCLUSION

Hence, the following main critical factors were obtained from the results of Anova technique “Financial failure of contract”, “change of scope”, “Time extension”, “delay in payment”, “Quality of work”, “Design variations initiated by the owner”. In this study, the main causes of disputes causes in the construction industry were identified. First of all the main causes of construction disputes were determined with a comprehensive literature review. Then, the disputes derived from the literature were classified into main groups. According to the classification, main disputes categories were found as owner related, contractor related disputes, design related disputes and contract related disputes. The future work will be carried out to find the most critical factors that cause disputes in the construction industry with the help of analytical tool One way ANOVA technique

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