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MICRO AND MACRO LEVELS OF DISPUTES CAUSES IN RESIDENTIAL BUILDING PROJECTS

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ABSTRACT

Disputes are inevitable in construction projects which predominantly arise from complexity and magnitude of works, multiple prime contracting parties, poorly prepared and/ or executed contract documents, inadequate planning, financial issues, and communication problems. Any of these factors can overturn a project and lead to complicated litigation, arbitration, mediation, time overrun; increased costs, and a relationship breakdown among members of different parties involved. The objectives of this study are to identify the 25 direct and 25 indirect causes of construction disputes in residential building projects. The methodology of the study adopted was a questionnaire survey where the target respondents were clients, consultants, engineers, and contractors. The causes are identified by the severity index method and the AHP method. The analysis of the identified causes indicates that the top five severe direct dispute causes are: contractor's experience, payment delay, main contractor financial problem, communication between site and head office, qualification of subcontractor respectively. While the top five indirect causes are: accidents that occur during construction, the financial failure of the contractor, Subcontractor problems with the contractor, inadequate contractor experience, and Management –labor relationships.

Keywords: Disputes, Residential Building, Construction.

1. INTRODUCTION

The construction industry is one of the major contributors to the development of a nation. . The growing demands of the construction industry have given rise to more disputes, delays, and consequently more claims. The construction industry is a complex and competitive environment in which participants with different views, talents, and levels of knowledge of the construction process work together. In this complex environment, participants from various professions, each have their own goals and each expects to make the most of its benefits. . The growing demands of the construction industry have given rise to more disputes, delays, and consequently more claims. The construction industry is a complex and competitive environment in which participants with different views, talents, and levels of knowledge of the construction process work together. In this complex environment, participants from various professions, each have their own goals and each expects to make the most of its benefits. There is confusion among construction professionals about the differences between conflict and dispute, and these terms have been used interchangeably, especially in the construction industry (Acharya et al., 2006). However, according to Fenn et al. (1997), conflict and dispute are two distinct notations. Conflict exists wherever there is an incompatibility of interest. Conflict can be managed, possibly to the extent of preventing a dispute resulting from the conflict. On the other hand, disputes are one of

the main factors which prevent the successful completion of the construction project. Disputes are common in the construction industry. Disputes arise due to disagreements between any of the contracting parties. Disputes have a devastating effect on construction projects, as they may result in cost overruns, delays, and loss of productivity. It is vital to understand the causes of disputes to complete a construction project within cost and time. Construction disputes impact project objectives and strain relationships between contracting parties. A dispute in construction projects is considered to impede the path of successful project completion. Disputes are resource-consuming, unpleasant, and expensive. Conflicts disrupt the flow of work, resulting in additional costs, delays, and other negative impacts. The objective of this study is to find out the Micro and Macro levels of disputes in residential construction projects.

1.1 Conflict, Claim, And Dispute

The terms conflict, claim, and dispute are often used interchangeably, but their meanings are very different. Figure 1 identifies the relationship between these terms. Examples of how each of these terms has been defined include:

- Conflict – "serious disagreement and agreement about something important" (Collins, 1995) [4]. Willmot and Hocker (1998) [5], on the other hand, provide a detailed definition of conflict as "an expressed struggle between at least two independent parties who perceive incompatible goals, scarce resources, and interference from other achieving those goals".
- Claim – "for the assertion of a right to money, property or remedy"(Powell- Smith and Stephenson, 1993) [6]. Likewise, Semple et al. (1994) [7] define a claim as "a request for compensation for damages incurred by any party to a contract".
- Dispute – "any contract question or controversy that must be settled beyond the Jobsite management" (Diekmann and Girard, 1995) [8].

2. RESEARCH METHODOLOGY

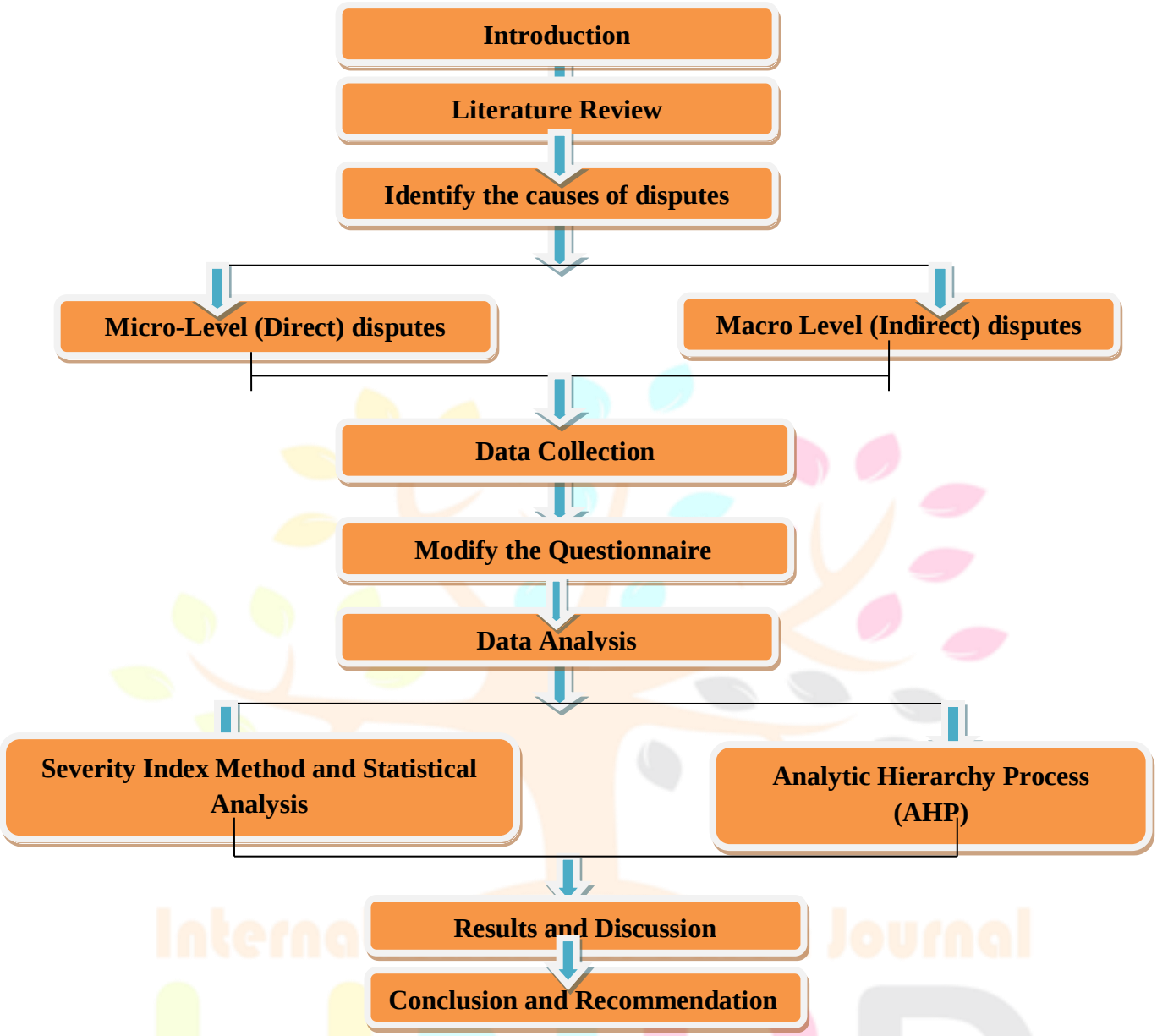
The expected of this research is to find out major and minor disputes causes in residential building projects. Besides that, we will also expect can analyze the disputes and causes of the project based on the information that we collect.
This research has been carried out with a careful study on data collected mainly from case studies and questionnaire survey exercises. The research was focused on the private and government projects which are faced with the problem of construction disputes.

2.1 Project Methodology

The methodology of the project consists of two phases as shown below (Refer to Figure 3.1):
i) Phase one
Gather information from journals, the internet, and book. Literature review on causes of construction disputes, the impact on Client's Organization, and methods of dispute recovery.

ii) Phase two
The second phase of the study has conducted a survey and discussions with relevant stakeholders, data collection from relevant stakeholders, data analysis and discussions, conclusions, and recommendations. The flow chart below illustrates the steps of the study (research methodology):

Fig.2.1 Methodology Flow chart



3. DATA COLLECTION AND ANALYSIS

A questionnaire survey was decided to be used for data collection. Questionnaires were distributed to the engineers requested through a web survey i.e. Google form. Direct dispute causes and indirect dispute causes are considered in this study. The questionnaire was divided into three main parts. Part I is related to general information for the company. The contractors were requested to answer questions about their experience in residential building projects. Part II includes the list of the identified direct dispute causes in residential building projects. Part III includes the list of the identified indirect dispute causes in residential building projects. In part II and part III, the respondents were required to rank the identified causes based on their severity using a 5-point scale as follows: very high, high, moderate, low, and very low (on a 5 to 1 point scale).

3.1 Data Analysis

3.3.1 Severity Index Method

The suggested dispute causes are ranked by the measurement of the severity index. The following formula is used to rank them based on the severity level as identified by the participants.

Severity Index (%) = $\sum a\,(n/N) \times 100/5$

Where **a** is the constant expressing weighting given to each response (ranges from 1 for very low up to 5 for very high), **n** is the frequency of the responses, and **N** is the total number of responses.

3.3.2 Statistical Analysis

Some statistical techniques are used to interpret the dispersion, compactness, and the degree of homogeneity of the responses for the influence of the identified dispute causes as assessed by the contractors. These techniques include computation of the weighted mean, standard deviation (Sn), and coefficient of variation (C.V.).

Table 1. Severity index and ranking of Micro level of dispute causes in residential building projects

Sr. no.	Direct Dispute Causes (Micro level)	S.I	Rank
1	Material Prices	**53.69**	**19**
2	Insufficient utilities available on site	**52.82**	**22**
3	Communication between site and head office	**65.43**	**4**
4	Site staff contract knowledge	**62.39**	**11**
5	Unforeseen problem	**50.43**	**25**
6	Inaccurate bill of quantities	**53.26**	**21**
7	Poor quality of completed work	**58.47**	**15**
8	Labor inefficiency	**56.30**	**16**
9	Contractor experience	**68.04**	**1**
10	Delay in site drawing	**63.91**	**8**
11	Problem with neighbors around the site	**51.08**	**24**
12	Materials damaged during storage	**53.69**	**20**
13	Main contractor financial problems	**65.65**	**3**
14	Insufficient specifications of materials	**56.12**	**17**
15	Qualifications of subcontractors	**64.78**	**5**
16	Evaluation of the quality and quantity of completed works	**59.78**	**13**
17	availability of information	**55.21**	**18**
18	Changes in economic and market conditions	**58.91**	**14**
19	time extensions	**64.56**	**6**

20	payment delays	**67.39**	**2**
21	Inspection delay by consultant	**63.47**	**9**
22	Lack of skilled labor	**64.34**	**7**
23	Adverse weather conditions	**51.52**	**23**
24	Lack of adequate manpower	**60.65**	**12**
25	Fluctuation in material cost and labor during construction	**62.82**	**10**

Table 2. Severity index and ranking of Macro level of dispute causes in residential building projects

Sr. no.	Indirect Dispute Causes (Macro level)	S.I	Rank
1	Poor estimation practice	**51.73**	**24**
2	Lack of communication between construction parties	**63.04**	**9**
3	Cash problem during construction	**64.13**	**6**
4	Incorrect planning	**57.82**	**19**
5	Waiting for samples material approval	**55.21**	**23**
6	Poor financial control on site	**59.78**	**14**
7	Management –labor relationship	**65.43**	**5**
8	Low skills of manpower	**60.65**	**11**
9	Shortage of equipment required	**58.69**	**15**
10	Low margin profit due to competition	**58.47**	**17**
11	Subcontractor problems with the contractor	**66.08**	**3**
12	Delay in materials delivery	**63.26**	**8**
13	Labor wages	**58.69**	**16**
14	lack of team spirit	**61.73**	**10**
15	Documents needed for notice are inaccessible	**57.82**	**20**
16	Equipment breakdown/maintenance	**56.08**	**21**
17	risk allocation	**58.47**	**18**
18	unrealistic expectations	**51.73**	**25**
19	The unclear vision of the owner to start with projects	**55.86**	**22**
20	Using the lower bid system	**60.43**	**13**
21	Inadequate contractor's experience	**65.65**	**4**
22	the financial failure of the contractor	**66.30**	**2**
23	late giving of possession	**60.65**	**12**

24	Accidents occurred during construction	**70.43**	**1**
25	Mistakes/rework during the construction stage	**64.13**	**7**

Figure 3.1 Direct causes versus Mean

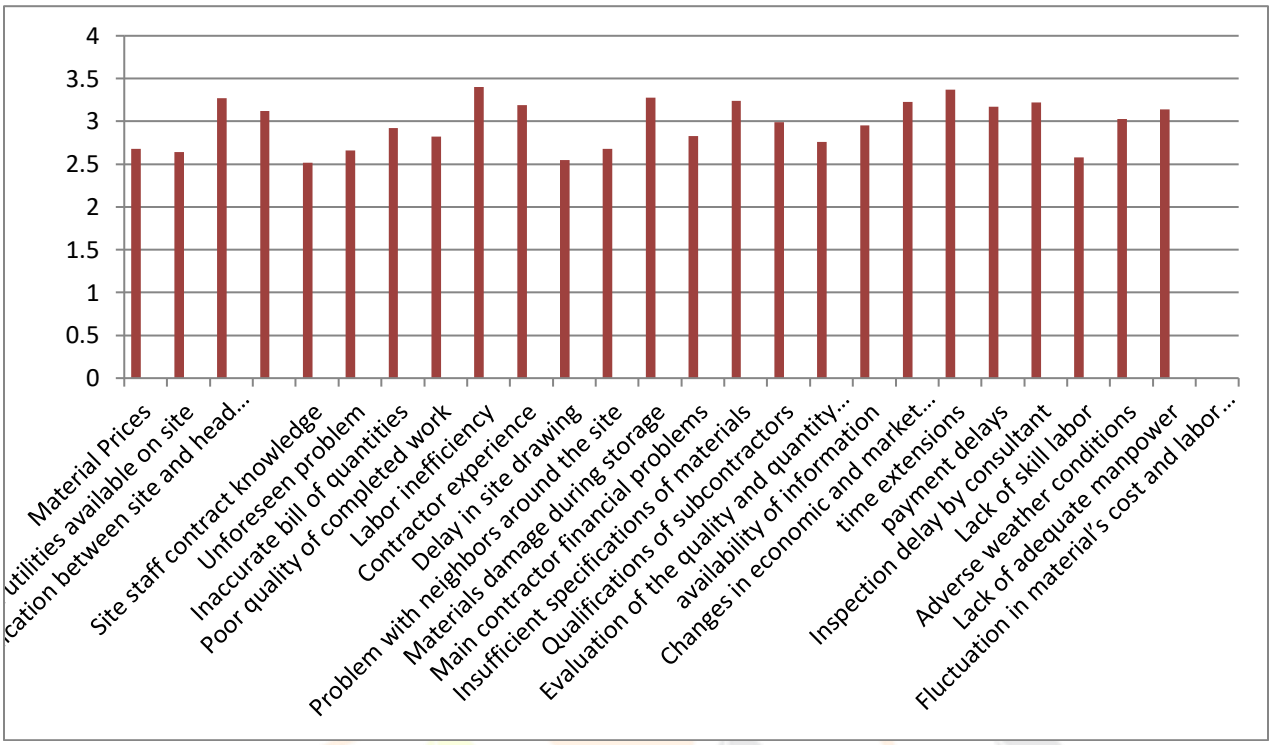
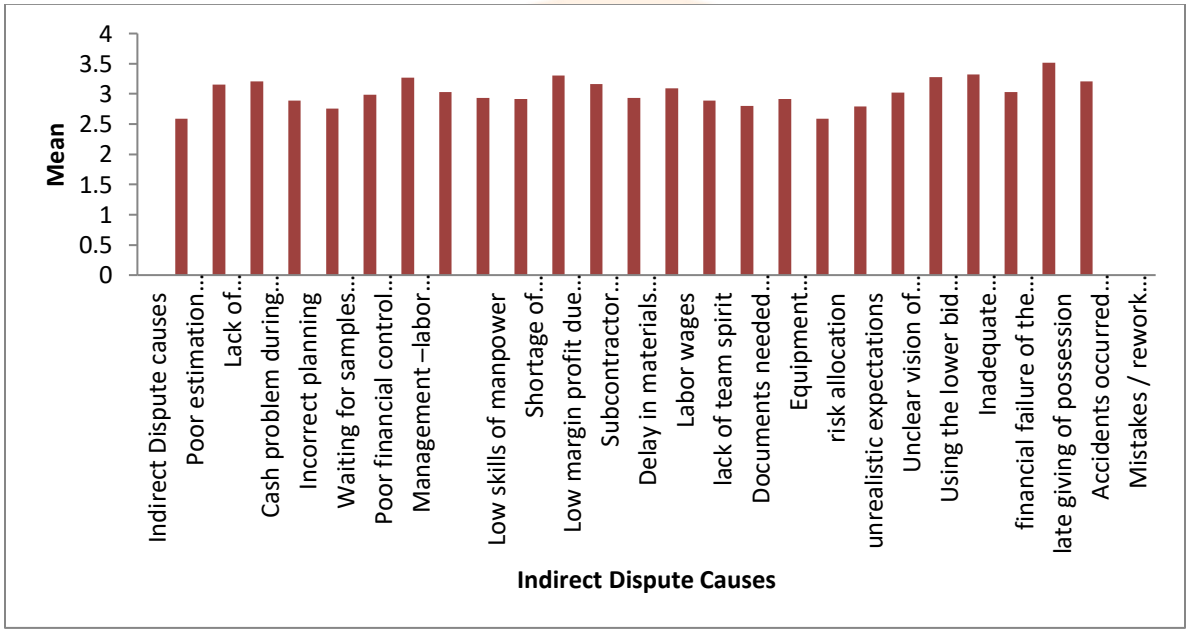


Figure 3.2 Indirect causes versus Mean



3.3.3 ANALYTIC HIERARCHY PROCESS (AHP)

The method of analytic hierarchy process (AHP) is one of the most used methods in decision-making processes, developed by Saaty. It aims to quantify the relative priority of the given set according to the appropriate value scale. The decision is usually based on the perception of the individual who is supposed to make the final decision and assess priorities, emphasizing the importance of consistency and correlation of the alternatives which have been compared in the whole decision-making process. AHP method is very flexible because it produces a simple way to find the relationship between criteria and alternatives. This method thereby assesses the relevance of the criteria in the real world and determines the interaction between the criteria, in case of complex problems with many criteria and a relatively large number of alternatives. By application of this method, complex problems could be decomposed into specific hierarchies so the analysis will include quantitative and qualitative aspects of the problem. AHP connects all levels of the hierarchy. This enables the recognition of how the change of one criterion affects the other criteria and alternatives.

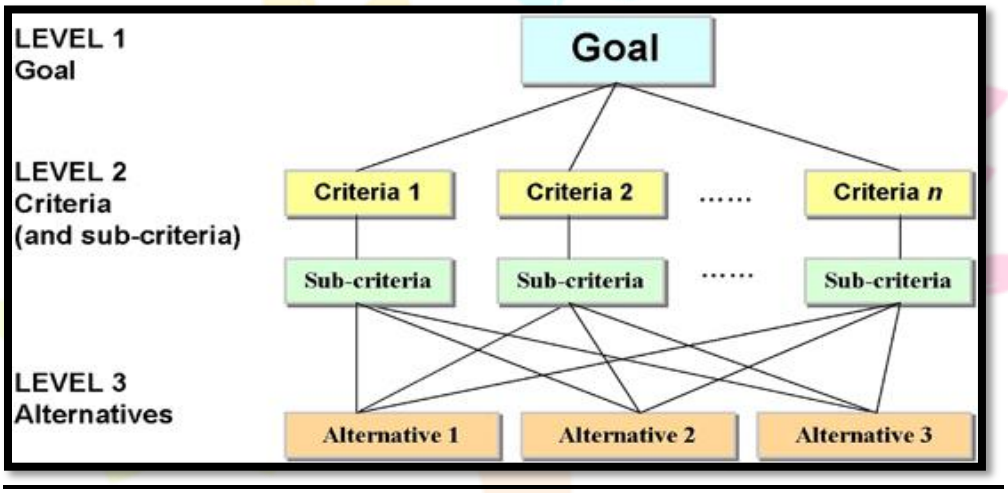


Figure 3.3.1 Example of Hierarchy in AHP

3.3.1 AHP for Micro-Level Causes

A hierarchy can be constructed by creative thinking, recollection, and using people's perspectives. The next step after the development of the structural hierarchy is to determine the priorities of elements at each level. A set of comparison matrices of all elements in a level concerning an element of the immediately superior level is constructed. The pair-wise comparisons are based on how much more important element A than element B is. The preference element is quantified using a nine-point scale.

Table A: Pair-wise Comparison Matrix

	Co-ordination	Delay	Quality and Workmanship	Design and Contract
Co-ordination	1	1/5	2	3
Delay	5	1	3	4
Quality and Workmanship	1/2	1/3	1	2
Design and Contract	1/3	1/4	½	1

	Co-ordination	Delay	Quality and	Design and

			Workmanship	Contract
Co-ordination	1	0.2	2	3
Delay	5	1	3	4
Quality and Workmanship	0.5	0.33	1	2
Design and Contract	0.33	0.25	0.5	1
∑ A	**6.83**	**1.78**	**6.5**	**10**

Table A1: Normalized Pair-wise Comparison Matrix

	Co-ordination	Delay	Quality and Workmanship	Design and Contract
Co-ordination	0.146	0.112	0.307	0.3
Delay	0.732	0.562	0.461	0.4
Quality and Workmanship	0.073	0.185	0.153	0.2
Design and Contract	0.048	0.140	0.076	0.1

Table A2: Criterion Weight (Taking average of Row)

	Co-ordination	Delay	Quality and Workmanship	Design and Contract	A2
Co-ordination	0.146	0.112	0.307	0.3	0.216
Delay	0.732	0.562	0.461	0.4	0.538
Quality and Workmanship	0.073	0.185	0.153	0.2	0.153
Design and Contract	0.048	0.140	0.076	0.1	0.091

Table A3: Check the consistency (Consider pair-wise comparison matrix)

	Co-ordination	Delay	Quality and Workmanship	Design and Contract	Weighted sum value A3
Weight	**0.216**	**0.538**	**0.153**	**0.091**	
Co-ordination	1	0.2	2	3	**0.903**
Delay	5	1	3	4	**2.441**
Quality and Workmanship	0.5	0.33	1	2	**0.620**
Design and Contract	0.33	0.25	0.5	1	**0.373**

- **To check the consistency calculate lambda:**

Weighted sum value A3	Weights A2	Lambda =A3/A2	Lambda max= Average of Lambda
0.903	0.216	4.180	
2.441	0.538	4.537	**4.216**
0.620	0.153	4.052	
0.373	0.091	4.098	

- **Consistency index (CI) = (lambda Max- n) / (n-1)=** (4.216 - 4) / (4 – 1)= 0.072
- **Consistency Ratio (CR) = (CI)/ (RI)=** 0.072/ 0.90 = 0.08
- If CR value is less than 0.10 then weights are acceptable.
- If the CR value is greater than 0.10 then re-evaluate the pair-wise comparison.

Table A4: Calculate the weighting factor and ranking for micro-level causes.

Sr. no.	Direct Dispute Causes (Micro level)	Mean	Mean weight	Weighting factor	Ranks
1	Material Prices	**2.68**	**1.084**	**2.90**	**19**
2	Insufficient utilities available on site	**2.64**	**1.084**	**2.86**	**22**
3	Communication between site and head office	**3.27**	**1.084**	**3.54**	**4**
4	Site staff contract knowledge	**3.12**	**1.084**	**3.40**	**11**
5	Unforeseen problem	**2.52**	**1.084**	**2.74**	**25**
6	Inaccurate bill of quantities	**2.66**	**1.084**	**2.88**	**21**
7	Poor quality of completed work	**2.92**	**1.084**	**3.18**	**15**
8	Labor inefficiency	**2.82**	**1.084**	**3.07**	**16**
9	Contractor experience	**3.40**	**1.084**	**3.70**	**1**
10	Delay in site drawing	**3.19**	**1.084**	**3.48**	**8**
11	Problem with neighbors around the site	**2.55**	**1.084**	**2.77**	**24**
12	Materials damaged during storage	**2.68**	**1.084**	**2.92**	**20**
13	Main contractor financial problems	**3.28**	**1.084**	**3.57**	**3**
14	Insufficient specifications of materials	**2.83**	**1.084**	**3.08**	**17**
15	Qualifications of subcontractors	**3.24**	**1.084**	**3.53**	**5**
16	Evaluation of the quality and quantity of completed works	**2.99**	**1.084**	**3.26**	**13**
17	availability of information	**2.76**	**1.084**	**3.00**	**18**

18	Changes in economic and market conditions	**2.95**	**1.084**	**3.21**	**14**
19	time extensions	**3.23**	**1.084**	**3.52**	**6**
20	payment delays	**3.37**	**1.084**	**3.67**	**2**
21	Inspection delay by consultant	**3.17**	**1.084**	**3.45**	**9**
22	Lack of skilled labor	**3.22**	**1.084**	**3.50**	**7**
23	Adverse weather conditions	**2.58**	**1.084**	**2.81**	**23**
24	Lack of adequate manpower	**3.03**	**1.084**	**3.30**	**12**
25	Fluctuation in material cost and labor during construction	**3.14**	**1.084**	**3.42**	**10**

3.3.2AHP for Macro level (Indirect) causes:

Table B: Pair-wise comparison matrix

	Owner	Contractor	Consultant	Engineer & Employer
Owner	1	5	4	7
Contractor	1/5	1	½	3
Consultant	¼	2	1	3
Engineer and employer	1/7	1/3	1/3	1

	Owner	Contractor	Consultant	Engineer & Employer
Owner	1	5	4	7
Contractor	0.2	1	0.5	3
Consultant	0.25	2	1	3
Engineer and employer	0.14	0.33	0.33	1
∑B	**1.59**	**8.33**	**2.83**	**14**

Table B1: Normalized Pair-wise Comparison Matrix

	Owner	Contractor	Consultant	Engineer & Employer
Owner	0.629	0.600	0.686	0.500
Contractor	0.126	0.120	0.086	0.214
Consultant	0.157	0.240	0.172	0.214
Engineer and employer	0.088	0.040	0.057	0.07

Table B2: Criterion weight (Taking Avg. of row)

	Owner	Contractor	Consultant	Engineer & Employer	B2
Owner	0.629	0.600	0.686	0.500	0.604
Contractor	0.126	0.120	0.086	0.214	0.136
Consultant	0.157	0.240	0.172	0.214	0.196
Engineer and employer	0.088	0.040	0.057	0.07	0.064

Table B3: Check the consistency

	Owner	Contractor	Consultant	Engineer & Employer	Weighted sum value (B3)
Weights (B2)	**0.604**	**0.136**	**0.196**	**0.064**	
Owner	1	5	4	7	**2.517**
Contractor	0.2	1	0.5	3	**0.547**
Consultant	0.25	2	1	3	**0.811**
Engineer and employer	0.14	0.33	0.33	1	**0.258**

- **To check the consistency calculate lambda:**

Weighted sum value B3	Weights B2	Lambda =B3/B2	Lambda max= Average of Lambda
2.517	0.604	4.168	
0.547	0.136	4.007	**4.089**
0.811	0.169	4.144	
0.258	0.064	4.037	

- **Consistency index (CI) = (lambda Max- n) / (n-1)=** (4.089- 4) / (4 – 1)= 0.030
- **Consistency Ratio (CR) = (CI)/ (RI)=** 0.030/ 0.90 = 0.0331
- If CR value is less than 0.10 then weights are acceptable.
- If the CR value is greater than 0.10 then re-evaluate the pair-wise comparison.

Table B4: Calculate the weighting factor and ranking for macro-level causes.

Sr. no.	Indirect Dispute Causes (Macro level)	Mean	Weight mean	Weighting factors	Ranks
1	Poor estimation practice	**2.59**	**1.033**	**2.67**	**24**
2	Lack of communication between construction parties	**3.15**	**1.033**	**3.25**	**9**

3	Cash problem during construction	**3.21**	**1.033**	**3.31**	**6**
4	Incorrect planning	**2.89**	**1.033**	**2.98**	**19**
5	Waiting for samples material approval	**2.76**	**1.033**	**2.85**	**23**
6	Poor financial control on site	**2.99**	**1.033**	**3.08**	**14**
7	Management –labor relationship	**3.27**	**1.033**	**3.37**	**5**
8	Low skills of manpower	**3.03**	**1.033**	**3.13**	**11**
9	Shortage of equipment required	**2.93**	**1.033**	**3.02**	**15**
10	Low margin profit due to competition	**2.92**	**1.033**	**3.02**	**17**
11	Subcontractor problems with the contractor	**3.30**	**1.033**	**3.40**	**3**
12	Delay in materials delivery	**3.16**	**1.033**	**3.26**	**8**
13	Labor wages	**2.93**	**1.033**	**3.03**	**16**
14	lack of team spirit	**3.09**	**1.033**	**3.19**	**10**
15	Documents needed for notice are inaccessible	**2.89**	**1.033**	**2.98**	**20**
16	Equipment breakdown/maintenance	**2.80**	**1.033**	**2.89**	**21**
17	risk allocation	**2.92**	**1.033**	**3.02**	**18**
18	unrealistic expectations	**2.59**	**1.033**	**2.67**	**25**
19	The unclear vision of the owner to start with projects	**2.79**	**1.033**	**2.88**	**22**
20	Using the lower bid system	**3.02**	**1.033**	**3.11**	**13**
21	Inadequate contractor's experience	**3.28**	**1.033**	**3.38**	**4**
22	the financial failure of the contractor	**3.32**	**1.033**	**3.43**	**2**
23	late giving of possession	**3.03**	**1.033**	**3.13**	**12**
24	Accidents occurred during construction	**3.52**	**1.033**	**3.63**	**1**
25	Mistakes/rework during the construction stage	**3.21**	**1.033**	**3.31**	**7**

4. RESULTS AND DISCUSSION

4.1 Result

Questions in the respondent profile were created to collect information such as job position, experience of the work, locations of the current and/or previous works, and contact information. It was studied; these questions in the survey were of great importance to the research by analyzing personal qualification concerns from a variety of different profiles from different regions.

To improve the questionnaire section, a pilot study was accompanied. This section contained identification of different causes in terms of severity using an ordinal scale. The application of this section benefited the better formation of the survey development.

A total of 50 direct(25) and indirect (25) dispute causes of questionnaires, were sent to laborers, contractors, architectures, owners, project managers, evaluators, and project engineers of various building construction organizations. The response rate by each respondent is 65%.

4.2 Discussion

4.2.1 Ranking of direct dispute causes (Micro level of causes)

In this study, 25 direct dispute causes in residential building projects were identified and ranked by the measurement of severity index according to Eq. (1). Table 1 and 2 shows the severity index value and ranking of the identified causes.
The result shows the following: (1) there are 4 causes with a severity index higher than 65, (2) there are 14 causes with a severity index between 55 to 65, and (3) the minimum severity index is 50.43. These results indicate that the identified causes are highly relevant to the dispute problem over the building residential projects.

Also, should be noted that the AHP method recommends using in the identification of direct and indirect causes.

- **For direct causes** Consistency index (CI) = (lambda Max- n) / (n-1) = 0.072
- Consistency Ratio (CR) = (CI)/ (RI)= 0.072/ 0.90 = 0.08
- **For indirect causes** consistency index (CI) = (lambda Max- n) / (n-1) = 0.030
- Consistency Ratio (CR) = (CI)/ (RI)= 0.030/ 0.90 = 0.0331
- If CR value is less than 0.10 then weights are acceptable.
- If the CR value is greater than 0.10 then re-evaluate the pair-wise comparison

5 CONCLUSION

This study aims at identifying direct and indirect dispute causes in residential building projects. To do so, 92 respondents completed a structured questionnaire survey. 25 direct dispute causes and 25 indirect dispute causes were identified through the literature review. The analysis of the identified causes indicated that the top five severe direct causes are: contractor's experience, payment delay, main contractor financial problem, communication between site and head office, qualification of subcontractor respectively. While the top five indirect causes are: accidents that occur during construction, the financial failure of the contractor, Subcontractor problems with the contractor, inadequate contractor experience, and Management –labor relationships.

The important conclusion withdrawn from the data analysis by the AHP method is that the contactor-related factors are the key sources for creating conflicts and disputes in the construction industry and then followed by third party and human-related factors. Based on the relative importance of the groups; Contractor factors ranked 1st, followed by Third-party & human Behavior factors, Owner related factors, then Design & contract-related factors, and last is Consultant related factors.
Thus, this study concludes that for the completion of the construction project as conflicts & disputes free, these above factors have to be managed carefully. This investigation likewise gives a decent direction to administrative & management groups and significant data to the managers which can be used to manage their projects in a better and more efficient way.

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