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Evaluate Chi-Test Application for Construction Projects

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Abstract: ***Construction comes square measure performed in a very advanced atmosphere that's categorised by risk and uncertainty. There square measure varied factors that have an effect on the incidence of those risks. —Risk is concerned in any construction comes. Management of risk is that the key for a flourishing project. Risk management is helpful for each shopper and contractor. Risk management goes into 3 main processes and that they are; Risk identification, Risk assessment and Risk response. Implementation of the method of risk management before the beginning of any section of the project can cause less impact on price, time and the quality of the project. Project risk mitigation can cut back dispute between the contractor and also the shopper also cut back the chance for each contractor and shopper. Therefore, a well-prepared contract will list all risks related to a project and assign appropriate mitigation for these risks. The target of this paper to spot all risks that the contractor or shopper could face throughout the execution of a project. The risks are going to be known and analyzed supported expertise and necessary mitigation of the known risks are going to be bestowed.***

Keywords: Risks, Causes of risks, Effect of risks, Relative important index, Chi- test statistics.

I. INTRODUCTION

The Construction project is exposed to a high degree of risk from the beginning of the project till the top of the project. Risk is outlined as any event or prevalence which could have an effect on the action of project goals. Risk management in construction comes is to deal effectively with uncertainty and sudden events that would have an effect on palmy and timely completion of the project. If risks don't seem to be known early throughout a project, it creates heaps of exposure and uncertainties to the project life cycle, thereby touching such aspects as value, schedule and quality of the project. additionally, it might additionally produce exposures within the space of Health, safety and surroundings. Hence, risk management permits project managers to spot, analyze, respond and manage the risks of the project.

This can be the rationale why risk management is extremely necessary for the palmy action for a project. In drafting the contract, the getting strategy ought to clearly outline the responsibilities of the shopper and the contractor and such ought to be specific and graspable.

This can be to form positive that the chance is evident for each the contractor and shopper thereby avoid future dispute. The importance of risk management in construction comes are reportable by many authors. It had been completed that risk management is crucial to construction activities in minimizing losses and enhancing profitableness. It had been explicit that risk management could be a technique that ought to be applied in associate degree trade to attain the goals of the trade, thus it's necessary to unfold awareness and build interest amongst individuals to use risk management techniques within the trade. The chance could be a measurable a part of uncertainty and is assumed as a deviation from the required level, thus the chance analysis is thus necessary for project choice and coordination of construction work. It had been explicit that risk management won't take away all risks from the comes, its main objective is to make sure that risks are managed most effectively.

II. OBJECTIVES

The main objectives of this study include the following:

A. To identify the causes of risks in construction projects.
B. To identify the approaches for solving the problems regarding risks.
C. To minimize the effect of risks in construction project.
D. To assess the criticality of risks in project performances.

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III.METHODOLOGY

A questionnaire survey was conducted by construction professionals representing various stakeholders involved in construction projects in India

A. Questionnaire Design

The questionnaire was designed based on critical factors were identified that contributed to the causes of risks. A questionnaire survey was developed to assess the perceptions of various construction professionals of the relative importance of causes and the effects of construction risks.

The questionnaire was designed into two sections: Section A; section B. Section A is to obtain the requested background information about the respondents. Section B is to obtain information on the factors that contribute to the causes of risks in construction projects from the perspective of construction professionals.

A total fifty two resource related factors were identified under three broad categories, namely manpower related, material related and equipment related issues.

The critical factors are listed in Table 1. A five point Likert scale (1 very low, 2 low, 3 moderate, 4 high, 5 very high) was adopted where respondents were asked to rank the importance and impact of a particular factor on risks in one of their selected projects. Descriptive statistical techniques, namely Relative Importance Index (RII) has been used to highlight the relative importance of critical factors as perceived by the respondents (Assaf et. al, 1995; Faridi and El-Sayegh, 2006; Iyer and Jha, 2005; kmaraswamy and Chan, 1998).

B. Analysis of Data

The data obtained was analyses to determine the relative importance of the various factors that contribute to causes of construction delays.

1) *Relative Importance Index (RII):* Assess the relative significance among risks, previous literature work study suggests establishing a risk significance index by calculating a significance score for each risk. For Calculating the significance score, multiply the probability of occurrence by the degree of Impact. The significance score for each risk assessed by each respondent can be obtained through the model

$$S^i_j = A^i_j * B^i_j$$

Where S^i_j = Significance score assessed by respondent j for risk i

A^i_j = Occurrence of risk i, assessed by respondent j

B^i_j = degree of impact of risk I, assessed by respondent j.

By averaging scores from every one of the reactions, it is conceivable to get a normal importance score for each hazard, and this normal score is known as the hazard record score and is utilized for positioning the dangers. The model for the figuring of hazard list score can be characterized as

$$R_s^i = \sum_j^T = 1\ S^i_j / T$$

Where R_s^i = index score for risk i

S^i_j = Significance score assessed by respondent j for risk i

T= total number of responses

Applicability of Test Results to Construction Industry -

2) *Hypothesis Analysis:* To test for hypothesis chi- test statistics was used to determine the significance of the level of importance attached to factors causing delays in building construction project (Odeh and Battaineh, 2005).

$$X^2_C = \sum (O_{i-Ei})^2 / Ei$$

Where:

a) The subscript “c” are the degrees of freedom.
b) O is the observed value(s).
c) E is the expected value(s).
d) X^2 chi –test statistics

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IV. RESULT AND DISCUSSIION

Table 4.1 Results

S.N	INTERVIEW NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	Total	Mean(m)	SD(s)	C.O.V=(s/m)
A	TECHNICAL RISKS																	
1	Inadequate specification	0.36	0.16	0.36	0.16	0.48	0.16	0.36	0.24	0.36	0.36	0.16	0.24	0.24	3.64	0.28	0.084	0.303
2	Incomplete design	0.24	0.36	0.36	0.36	0.24	0.36	0.16	0.16	0.16	0.16	0.24	0.16	0.24	3.2	0.246	0	0
3	Unknown site conditions	0.24	0.36	0.36	0.36	0.16	0.36	0.36	0.16	0.36	0.16	0.24	0.16	0.16	3.44	0.264	0.056	0.213
4	Investigation Change in scope	0.24	0.36	0.36	0.36	0.36	0.16	0.36	0.36	0.16	0.16	0.36	0.24	0.24	3.72	0.286	0	0
5	Construction procedures	0.24	0.36	0.36	0.36	0.36	0.36	0.36	0.16	0.36	0.16	0.24	0.36	0.24	3.92	0.301	0	0
6	Labor shortages	0.36	0.16	0.36	0.36	0.36	0.16	0.48	0.16	0.16	0.36	0.24	0.24	0.36	3.76	0.289	0	0
7	Errors in design drawing	0.64	0.36	0.64	0.36	0.36	0.36	0.32	0.36	0.36	0.36	0.36	0.36	0.36	5.2	0.4	0.197	0.494
8	Material shortage	0.16	0.48	0.36	0.36	0.36	0.36	0.36	0.16	0.24	0.16	0.36	0.16	0.16	3.68	0.283	0	0
9	Industrial disputes	0.24	0.36	0.48	0.48	0.48	0.16	0.24	0.36	0.24	0.16	0.16	0.24	0.16	3.76	0.289	0.056	0.195
10	Incompetence of transportation facilities	0.36	0.64	0.64	0.48	0.36	0.36	0.24	0.48	0.24	0.16	0.16	0.16	0.16	4.44	0.341	0.141	0.414
B	CONSTRUCTION RISKS																	
1	Labour productivity	0.36	0.64	0.36	0.64	0.48	0.36	0.64	0.36	0.24	0.36	0.36	0.36	0.48	5.64	0.433846154	0.084	0.195
2	Labour disputes	0.36	0.64	0.36	0.64	0.48	0.36	0.64	0.36	0.24	0.36	0.48	0.48	0.48	5.88	0.452307692	0.084	0.187
3	Site condition	0.16	0.64	0.36	0.64	0.36	0.36	0.64	0.36	0.16	0.16	0.64	0.32	0.32	5.12	0.393846154	0.113	0.287
4	Equipment failures	0.16	0.16	0.36	0.36	0.16	0.36	0.48	0.24	0.8	0.36	0.16	0.36	0.36	4.32	0.332307692	0.141	0.425
5	Design changes	0.36	0.36	0.36	0.36	0.16	0.36	0.36	0.36	0.8	0.36	0.24	0.36	0.24	4.68	0.36	0.084	0.235
6	Too high quality standard	0.36	0.36	0.64	0.36	0.24	0.48	0.36	0.48	0.8	0.36	0.36	0.36	0.24	5.4	0.415384615	0.084	0.204
7	New tecnology	0.64	0.36	0.36	0.36	0.24	0.48	0.48	0.36	0.8	0.24	0.48	0.36	0.36	5.52	0.424615385	0.197	0.466
C	PHYSICAL RISKS																	
1	Damage to structure	0.64	0.64	0.48	0.64	0.36	0.48	0.64	0.48	0.6	0.64	0.36	0.64	0.36	6.96	0.535384615	0.197	0.369
2	Damage to equipment	0.64	0.64	0.64	0.64	0.36	0.48	0.64	0.36	0.6	0.36	0.36	0.64	0.32	6.68	0.513846154	0.226	0.440
3	Labour injuries	1	0.64	0.64	0.64	0.48	0.48	0.64	0.36	0.48	0.36	0.36	0.8	0.32	7.2	0.553846154	0.480	0.868
4	Equipment and material fire and theft	0.48	0.48	0.36	0.64	0.64	0.48	0.64	0.64	0.64	0.64	0.64	0.64	0.24	7.16	0.550769231	0.169	0.308
D	FINANCIAL RISKS																	
1	Increased material cost	0.36	0.64	0.64	0.8	0.64	0.64	0.36	0.48	0.48	0.64	0.48	0.6	0.32	7.08	0.544615385	0.028	0.0519
2	Low market demand	0.36	0.64	0.8	0.64	0.64	0.48	0.64	0.36	0.48	0.64	0.64	0.8	0.32	7.44	0.572307692	0.028	0.049
3	Exchange rate fluctuation	0.64	1	0.8	0.8	0.48	0.48	0.36	0.8	0.36	0.8	0.48	0.6	0.48	8.08	0.621538462	0.113	0.182
4	Payment delays	0.64	0.64	0.48	0.8	0.48	0.48	0.64	0.8	0.36	0.8	0.64	0.64	0.6	8	0.615384615	0.028	0.045
5	Improper estimation taxes	0.6	0.64	0.8	0.8	0.48	0.36	0.64	0.64	0.36	0.64	0.48	0.64	0.8	7.88	0.606153846	0.141	0.233
6	Change in bank formalities and lenders	0.64	0.8	0.8	0.64	0.48	0.48	0.36	0.6	0.36	0.36	0.36	0.48	0.64	7	0.538461538	0	0
7	Insurances risks	0.24	1	0.8	0.64	0.48	0.48	0.36	0.64	0.36	0.48	0.64	0.8	0.36	7.28	0.56	0.084	0.151
8	Taxes and burden	0.8	0.64	0.8	0.64	0.48	0.64	0.48	0.64	0.48	0.64	0.48	0.48	0.48	7.68	0.590769231	0.226	0.383
9	Inexperienced when pricing tender	0.8	0.8	0.8	0.64	0.48	0.48	0.48	0.64	0.64	0.48	0.64	0.48	0.64	8	0.615384615	0.113	0.183
10	Loss due to fluctuation of interest rate	0.8	0.8	0.8	0.64	0.36	0.48	0.64	0.64	0.64	0.16	0.8	0.8	0.36	7.92	0.609230769	0.311	0.510
E	SOCIO-POLTICAL RISKS																	
1	Changes in laws and regulations	0.64	0.8	0.64	0.8	0.64	1	0.8	0.8	0.8	0.8	0.48	0.64	0.6	9.44	0.726153846	0.028	0.0389
2	Pollution and safety rules	0.36	0.8	0.36	0.8	0.64	0.48	1	0.48	0.8	0.48	0.36	0.8	0.64	8	0.615384615	0.197	0.321
3	Bribery/Corruption	0.64	0.8	0.36	0.8	0.64	0.36	0.64	0.8	0.8	0.48	0.36	0.64	0.36	7.68	0.590769231	0.197	0.335
4	Language/Cultural barrier	0.64	0.8	0.36	0.8	0.36	0.64	0.6	0.24	0.6	0.48	0.36	0.64	0.36	6.88	0.529230769	0.197	0.374
5	Law and order	0.64	0.64	0.36	0.8	0.36	0.36	0.64	0.48	0.64	0.48	0.24	0.64	0.36	6.64	0.510769231	0.197	0.387

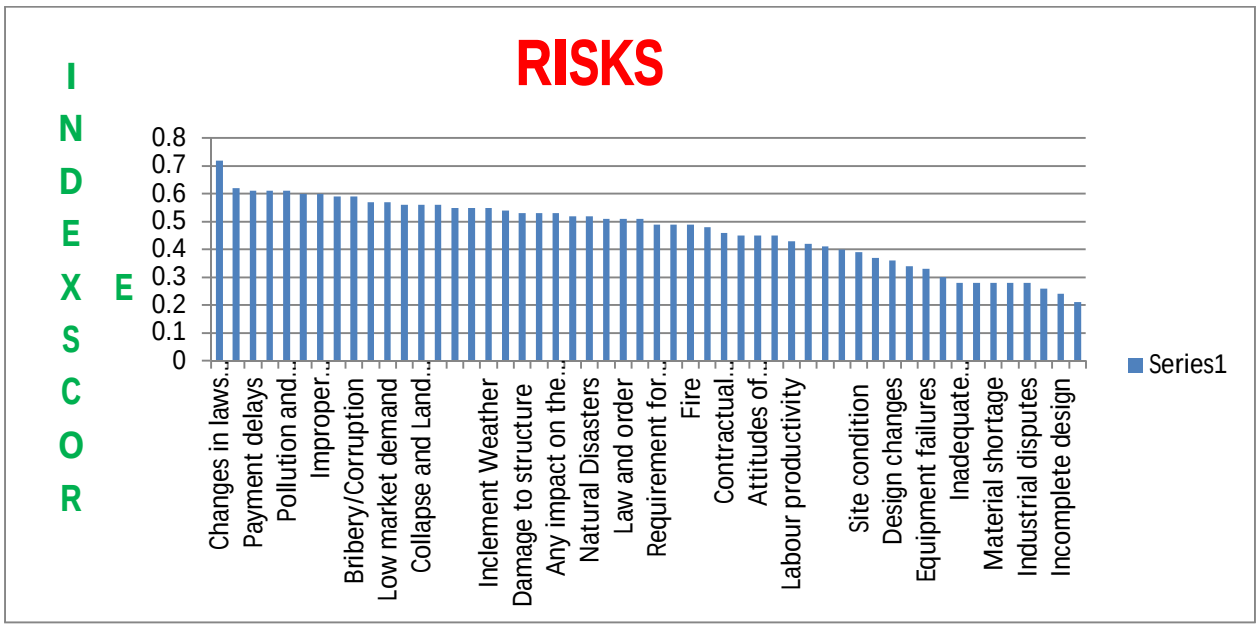
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6	War and civil disorder	0.36	0.36	0.24	0.64	0.48	0.64	0.8	0.48	0.64	0.24	0.24	0.48	0.64	6.24	0.48	0.197	0.412
7	Requirement for permits and their approval	0.36	0.36	0.48	0.48	0.48	0.64	0.6	0.64	0.8	0.24	0.24	0.48	0.64	6.44	0.495384615	0.197	0.399
F	ORGANISATIONAL RISKS																	
1	Contractual relations	0.36	0.36	0.64	0.36	0.36	0.36	0.48	0.8	0.64	0.36	0.32	0.64	0.32	6	0.461538462	0.028	0.0612
2	Contractor's experience	0.64	0.36	0.64	0.36	0.36	0.36	0.32	0.8	0.64	0.36	0.32	0.64	0.16	5.96	0.458461538	0.339	0.740
3	Attitudes of participants	0.64	0.36	0.64	0.36	0.36	0.48	0.36	0.8	0.64	0.36	0.12	0.64	0.16	5.92	0.455384615	0.339	0.745
4	Inexperienced work force	0.64	0.36	0.64	0.48	0.64	0.64	0.36	0.8	0.64	0.64	0.12	0.48	0.24	6.68	0.513846154	0.282	0.550
5	Communication	0.36	0.08	0.24	0.16	0.24	0.24	0.24	0.16	0.12	0.24	0.48	0.16	0.12	2.84	0.218461538	0.169	0.776
G	ENVIRONMENT RISKS																	
1	Weather implications	0.36	0.36	0.36	0.36	0.36	0.48	0.32	0.36	0.24	0.32	0.36	0.48	0.48	4.84	0.372307692	0.084	0.227
2	Natural Disasters	1	0.64	0.64	0.64	0.36	0.64	0.36	0.32	0.48	0.48	0.36	0.48	0.48	6.88	0.529230769	0.367	0.694
3	Any adverse impact on project due to climatic conditions	0.8	0.64	0.64	0.64	0.64	0.48	0.36	0.36	0.64	0.64	0.24	0.48	0.8	7.36	0.566153846	0	0
4	Any impact on the environment due to the project	0.64	1	0.64	0.64	0.8	0.48	0.32	0.32	0.64	0.48	0.24	0.48	0.8	7.48	0.575384615	0.113	0.196
5	Inclement Weather	0.64	0.64	1	0.64	0.8	0.48	0.48	0.36	0.48	0.36	0.24	0.48	0.64	7.24	0.556923077	0	0
6	Collapse and Land slide	0.64	0.64	1	0.64	0.64	0.48	0.48	0.24	0.48	0.36	0.24	0.64	0.8	7.28	0.56	0.113	0.202
7	Local people support for the project	0.36	1	0.64	0.36	0.48	0.48	0.24	0.36	0.48	0.48	0.24	0.64	0.64	6.4	0.492307692	0.197	0.402
8	Any impact on the environment due to the project	0.64	0.64	0.64	0.64	0.64	0.64	0.48	0.32	0.48	0.48	0.24	0.48	0.64	6.96	0.535384615	0	0
9	Fire	0.36	0.64	0.8	0.36	0.8	0.48	0.24	0.36	0.36	0.48	0.36	0.6	0.64	6.48	0.498461538	0.197	0.397

S.No	Risks	Index Score	Rank order
1	Changes in laws and regulations	0.72	1
2	Exchange rate fluctuation	0.62	2
3	Payment delays	0.61	3
4	Inexperienced when pricing tender	0.61	3
5	Pollution and safety rules	0.61	3
6	Loss due to fluctuation of interest rate	0.6	4
7	Improper estimation taxes	0.6	4
8	Taxes and burden	0.59	5
9	Bribery/Corruption	0.59	5
10	Any impact on the environment due to the project	0.57	6
11	Low market demand	0.57	6
12	Any adverse impact on project due to climatic conditions	0.56	7
13	Collapse and Land slide	0.56	7
14	Insurances risks	0.56	7
15	Equipment and material fire and theft	0.55	8
16	Labour injuries	0.55	8
17	Inclement Weather	0.55	8
18	Increased material cost	0.54	9
19	Damage to structure	0.53	10
20	Change in bank formalities and lenders	0.53	10
21	Any impact on the environment due to the project	0.53	10
22	Language/Cultural barrier	0.52	11
23	Natural Disasters	0.52	11

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24	Damage to equipment	0.51	12
25	Law and order	0.51	12
26	Inexperienced work force	0.51	12
27	Requirement for permits and their approval	0.49	13
28	Local people support for the project	0.49	13
29	Fire	0.49	13
30	War and civil disorder	0.48	14
31	Contractual relations	0.46	15
32	Contractor's experience	0.45	16
33	Attitudes of participants	0.45	16
34	Labour disputes	0.45	17
35	Labour productivity	0.43	18
36	New tecnology	0.42	19
37	Too high quality standard	0.41	20
38	Errors in design drawing	0.4	21
39	Site condition	0.39	22
40	Weather implications	0.37	23
41	Design changes	0.36	24
42	Incompetence of transportation facilities	0.34	25
43	Equipment failures	0.33	26
44	Construction procedures	0.3	27
45	Inadequate specification	0.28	28
46	Investigation Change in scope	0.28	28
47	Material shortage	0.28	28
48	Labor shortages	0.28	28
49	Industrial disputes	0.28	28
50	Unknown site conditions	0.26	29
51	Incomplete design	0.24	30
52	Communication	0.21	31



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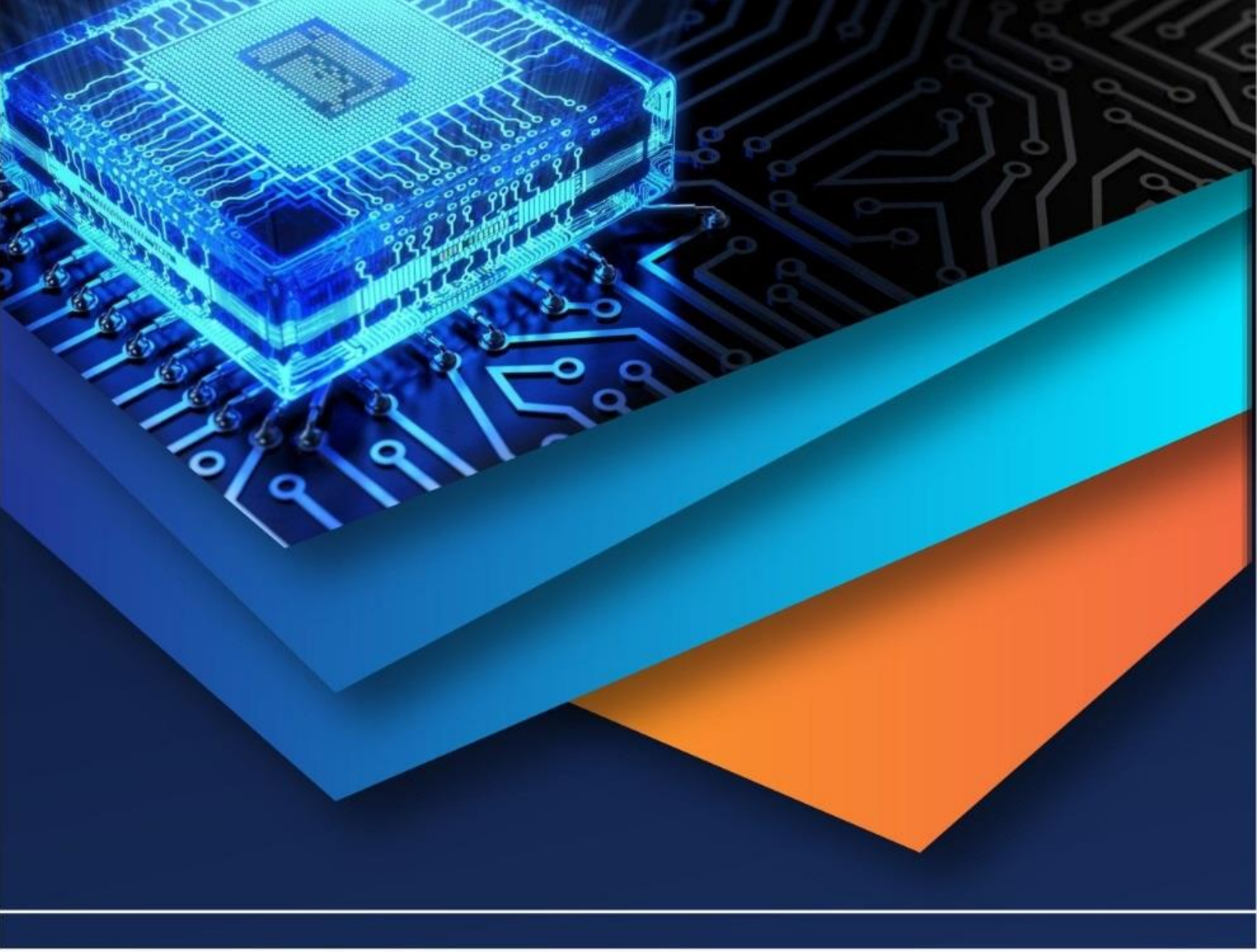
V. CONCLUSION

Risk management can be a useful technique for every client and contractor. Characteristic the risks throughout drafting new contracts associated assign an acceptable response to every familiar risk will cause a positive impact on the project in terms of some time, quality and value. Therefore,risk management, mitigation got to begin from drafting the contract. A good risk management method encourages the development company to spot and quantify risks and to contemplate risking containment and risk reduction policies. Construction corporations that manage risk effectively and with efficiency relish money savings, and larger productivity, improved success rates of recent comes and higher deciding. Risk management within the construction project management context may be a comprehensive and systematic means of distinguishing, analyzing and responding to risks to attain the project objectives. The analysis results show that the Lithuanian construction company considerably takes issue from the development corporations in foreign countries within the adoption of risk management practices. To manage the danger effectively and with efficiency, the contractor should perceive risk responsibilities, risk event conditions, risk preference, and risk management capabilities. The danger management framework for construction comes may be improved by combining qualitative and quantitative methodologies to risk analysis

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