iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** XII **Month of publication:** December 2018

DOI:

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue XII, Dec 2018- Available at www.ijraset.com

To Study the Project Cost Analysis & Factors Affecting Inflation

Avinash R. Yadav[1], R. M. Swamy[2]
[1]*M.E. Construction Engineering and Management, S.S.J.C.E.T., Asangaon, Maharashtra,*
[2]*Professor, Dept. of Civil Engineering, S.S.J.C.E.T., Asangaon, Maharashtra*

Abstract: Construction projects in India are experiencing widespread delays. Due to a dramatic shift in the capacity and volume of the Indian construction sector over the last decade, the need of a systematic analysis of the reasons of delays and developing a clear understanding among the industry professionals are highly crucial.
Using a selected set of attributes, this research first identified the key factors impacting delay in Indian construction industry and then established the relationship between the critical attributes for developing prediction models for assessing the impacts of these factors on delay. A questionnaire and personal interviews have formed the basis of this research. Factor analysis and regression modelling were used to examine the significance of the delay factors.
Keywords: Cost Saving, Excess, Overrun, Variation, Termination, Arbitration, Clustering.

I. INTRODUCTION

Construction industry is very important in the economic development of any nation especially in expanding economy like India. It controls the capital flow, as well as labour resources, which had cost implications. As a result of this, proper management of these resources is considered an important aspect of project works. Likewise if the resources are adequately harnessed, issues that relate to cost overrun would not arise which could result to variations and claims. Some firms rely on claims as a result of variation incurred during the course of the project execution and afterward evaluate their profit after incurring necessary and unnecessary costs on a project. Many factors affect the accuracy of building construction projects cost estimating which should be considered in the early stage of the estimating process. Some factors can incorrectly increase the estimated costs and the possibility of contractual disputes between the various parties involved. Other factors can help the estimator to decrease the unnecessary cost of an item and hence lead to successful tendering in a very competitive market. Therefore, accurate estimating requires detailed study of the biding documents and the environmental situation. It also involves a careful analysis of all projects data in order to arrive to the most accurate estimate of the probable cost consistent with the bidding time available and the accuracy and completeness of the information submitted. Therefore, it is essential to identify the actual causes of overrun in order to minimize and avoid the overruns and their corresponding expenses. Overruns in construction can cause a number of changes in a project such as late completion, lost productivity, acceleration, increased costs, and contract termination. The party experiencing damages and the parties responsible for them are in turn responsible to recover time and cost. However, in general overrun situations are complex in nature. A overrun in an activity may not result in the same amount of project overrun. A delay caused by a party may or may not affect the project completion date and may or may not cause damage to another party. A delay may occur concurrently with other delays and all of them may impact the project completion date. Delays caused by the client such as late submission of drawings and specifications, frequent change orders, and inadequate site information generates claims from both the main contractors and subcontractors which many times entail lengthy court proceedings with huge repercussions. Delays caused by contractors can generally be attributes to poor managerial skills. Lack of planning and a poor understanding of accounting and financial principles have led to many a contractor's downfall.

II. CAUSES IN OVERRUN IN CONSTRUCTION

Construction overrun is considered to be one of the most recurring problems in the construction industry and it has an adverse effect on project success in terms of cost, time, quality, and safety. Cost, time, and quality have proven their importance as the prime measures for project success. They are usually accompanied by cost overruns. Overrun has a negative effect on clients, contractors, and consultants in terms of grow thin adversarial relationships, mistrust, litigation, arbitration, and cash-flow problems. A project may be regarded as a successful endeavour until it satisfies the cost, time, and quality limitations applied to it. However, it is not uncommon to see a construction project failing to achieve its goal within the specified cost, time, and quality. The causes of overruns where categorized into eight related groups namely:

1) Project group
2) Owner group
3) Materials and equipment group
4) Laborers group
5) External group
6) Design group
7) Contractor group
8) Consultant group

The causes where ranked and recommendations to reduce time overrun in construction projects where given to the government, owners, contractors, and consultants. Finally, the literature concluded with determining top five severe causes of overrun as seen from the combined view of contractors and consultants. They are as follows:

1) Political situation
2) Segmentation
3) Award project to lowest bid price
4) Progress payments delay by owner; and
5) Shortage of equipment's Conversely, the bottom five causes of overrun as seen from the combined view of contractors and consultants are:
6) Poor ground conditions
7) Insufficient inspectors
8) Inappropriate design
9) Monopoly; and
10) Natural disaster

The study identified ten most important causes of delay from a list of 69 different causes. Ten most important causes of overrun were:

1) Contractor's improper planning
2) Contractor's poor site management
3) Inadequate contractor experience
4) Inadequate client's finance and payments for completed work
5) Problems with subcontractors
6) Shortage in material
7) Labor supply
8) Equipment availability and failure
9) Lack of communication between parties
10) Mistakes during the construction stage

The survey showed that all three groups generally agree on the ranking of individual overrun factors. The factors were categorized into nine major groups and were ranked. The nine groups were material, manpower, equipment, financing, changes, government relations, scheduling and controlling, environment, and contractual relationships. Based on the contractors surveyed, the most important overrun factors were:

1) Preparation and approval of shop
2) drawings
3) Delays in contractor's progress
4) Payment by owners and
5) Design changes

From the view of architects and engineers, the cash problems during construction, the relationship between subcontractors and the slow decision making progress of the owner were the main causes of overrun. However, the owners agreed that the design errors, labour shortages and inadequate labour skills were important overrun factors. Both owners and consultants specify labour and contractor related causes as the severe and important sources of overrun while, contractors indicate that the important sources of overrun in construction projects are owners and consultant.

III.MINIMIZATION OF CONSTRUCTION OVERRUNS

When a construction overrun occurs, there is no question that the owner suffers financially, but the extent to which an owner can recover its loss of income from the contractor, and more importantly minimize the risk that such overruns will occur, depends largely on how the construction contract was drawn up. Based on several studies of project success factors and rectification of overruns in construction project.

IV.LITERATURE REVIEW

Overrun is one of the biggest problems offer experienced on construction project sites. Overrun in sites gets negative effect such as increased cost loss of productivity and revenue may low suits between owners and contractors and contract termination. There are many factors that induce overrun on construction projects. However in some of identified factor, includes lack of funds of finance the project to completion change in drawings, lack of effective communication. Among the parties involved lack of adequate information from consultants, slow decision making and contractor's insolvency variations among others. Project management problems, mistakes during construction, bad weather, fluctuation in prices of building materials in appropriate overall organizational structure linking to the project and labour are some other main reasons behind overrun of project. The study until now was carried out on the causes of overrun and inflation of project cost. Many researchers defined different methods for optimizing cost of project after overrun. This study will continue with framing a relationship between overrun and profitability of the project facing overrun problem.

V. QUESTIONNAIRE DESIGN

Data were gathered through a questionnaire. The questionnaire is divided into two main parts. First is related to general information for both the company and respondent. Both contractors and consultants were further requested to answer questions pertaining to their experience in the construction industry and their opinions about the percentage average time overrun in projects and its relation with profit they experienced. Second part is includes the list of the identified causes of overrun in construction project related to profit. These causes are classified into nine groups according to the sources of overrun: factors related to project, owner, contractor, consultant, design-team, materials, equipment, manpower, and external factors.

For each cause/factor two questions were asked: what is the frequency of occurrence for this cause? And what is the degree of severity of this cause on project overrun? Both frequency of occurrence and severity were categorized on a four-point scale. Frequency of occurrence is categorized as follows: always, often, sometimes and rarely. Similarly, degree of severity was categorized as follows: extreme, great, moderate and little.

A. Preparation of Questionnaire

Identification of critical attributes for the study and preparation of questionnaire is a crucial step for the success of the research. Significant amount of work has already been done on causes of construction overrun and there is a well documented and peer-reviewed set of overrun attributes available in the literature. For this research, the questionnaire has been prepared by incorporating the key overrun attributes reported in the literature. A total overrun attributes were identified under six broad categories namely project related, site related, process related, human related, authority related and technical issues. To reflect the cross-section of the already available overrun attributes in the Indian context, personal interviews with Indian construction experts were also conducted. The final questionnaire survey was on design based on these two inputs. The research was designed to be used with two statistical techniques namely factor analysis and regression modeling. In addition, descriptive analysis was also performed on the attributes using the raw data collected in the survey. Descriptive analysis is an important measure for ranking the attributes in terms of their criticality as perceived by the respondents.

This is similar to the analysis of the basic statistics on collected samples to investigate the trends of perceptions of certain industry practices based on first hand experiences of the practitioners. As such analysis does not provide any meaningful outcomes in terms of understanding the clustering effects of the similar attributes and the predictive capacity, further analysis is required using advanced statistical methods. Factor analysis was used to reduce the attributes for investigating the clustering effects while regression analysis was performed for deriving a predictive model based on the best fit attributes for forecasting time performance in the project. Factor analysis is primarily used to get greater insight among numerous correlated but seemingly unrelated attributes into a much fewer underlying factors. The results form a firm basis for identifying the criticality of attributes on construction impact. An attempt to achieve this multiple regression analysis is considered a most suitable method to derive the relationship between the attributes. With these research design issues in mind a survey of Indian construction professionals was conducted.

VI. RESPONDENT'S PROFILE

Respondents are selected from a wide range of professionals engaged in the Indian construction sector. All the respondents identified had experience in relatively large engineering construction projects in the Indian context. The sample consisted of owners, architects, structural engineers, service engineers, project managers, contract administrators, design managers and construction managers. As seen, the mix of disciplines was well proportioned in the sample. In order to get the best possible response commensurate by the experience and expertise, introductory conversations and email contacts were made with each respondent to explain and make the objectives of the research clear.

VII. RANKING OF ATTRIBUTES

Mean and standard deviation of each individual attribute is not a suitable measure to assess overall rankings as they do not reflect any relationship between them and hence used RII which can be calculated using the following equation:

$$\text{RII}\left(\begin{array}{c}\text{Relative}\\ \text{Importance}\\ \text{Index}\end{array}\right) - \frac{\sum w}{A \times N}$$

W =Weight given to each attribute by respondent

A= Highest weight

N =Total number of respondents

The attributes are arranged in ascending order of ranks, attribute with highest RII or rank 1 indicates that it has the maximum impact on the Overrun while the attribute with lowest rank indicates that it has the least impact on Overrun duration. However RII doesn't talk about the relationship between the various attributes. To identify if there is a relationship between the selected attributes, Spearman rank correlation is used. It assesses how well the relationship between two variables can be described using a monotonic function. The sign of the Spearman correlation indicates the direction of association between X and Y. A Spearman correlation of zero indicates that there is no tendency for Y to either increase or decrease when X increases.

VIII. CAUSES OF OVERRUN

The three main parts in completion of the work as per schedule is done connecting owner contractor and consultants. Proper coordination between these 3 main members will improve the quality and effectively of the project work and completing a certain project in time. The following table describes the factor needed to be controlled by respective authority as shown in table.

Sr. no.	Owners	Contractors	Consultants
1	Type of project bidding and award	Delay in progress payments by owner	Type of project bidding and award
2	Shortage of labors	Suspension of work by owner	Change orders by owner during construction
3	Ineffective planning and scheduling of project by contractor	Late in reviewing and approving design documents by owner	Shortage of labors
4	Low productivity level of labors	Change orders by owner during construction	Ineffective planning and scheduling of project by contractor
5	Unqualified work force	Late procurement of materials	Delay in progress payments by owner
6	Change orders by owner during construction	Mistakes and discrepancies in design documents	Low productivity level of labors
7	Hot weather effect on construction activities	Delays in producing design documents	Unavailability of incentives for contractor to finish ahead of schedule
8	Type of construction contract (turnkey, construction only)	Difficulties in financing project by contractor	Ineffective delay penalties
9	Poor site management and supervision by contractor	Late in reviewing and approving design documents by consultant	Hot weather effect on construction activities
10	Conflicts encountered with subcontractors schedule in project execution	Slowness in decision-making process by owner	Poor qualification of the contractors technical staff
11	Unqualified work force	Late in reviewing and approving design documents by owner	Shortage of labors
12	Effects of subsurface conditions (soil, existing of utilities, high water table, etc)	Inflexibility (rigidity) of consultant	Poor qualification of the contractors technical staff
13	Inadequate contractors experience	Late procurement of materials	Poor site management and supervision by contractor

Table No. 1: Causes of Overrun

IX. PROJECT CAUSES OF OVERRUN DUE TO CLIENT AFFECTING PROFITABILITY OF PROJECT

The owner of the project decides the final changes to be done in grid and is main source of financial support for whole process. Hence factors related to the client directly affect the profit of the project. Convincing client for interoperating changes and then seeing funds takes a long time. Now in ownership there are some times the partnership deals with not proper deal with each other and their conflicts lead to more and more overrun problem.

Sr. No	Cause Of Overrun	Responsible Authority and Person	Total	Frequency					RII	%
				1	2	3	4	5		
1	Delay in progress payments	Client	89	7	7	4	4	8	0.59	59.33
2	Delay in delivering the site to the contractor	Client	64	15	7	2	1	5	0.43	42.67
3	Frequent change orders during construction by client	Client	80	13	4	2	2	9	0.53	53.33
4	Late in approving design documents	Client	74	12	5	5	3	5	0.49	49.33
5	Unrealistic contract duration	Client	81	6	11	4	4	5	0.54	54.00
6	Work suspension by clients	Client	67	17	2	3	3	5	0.45	44.67
7	Delay in decision making process	Client	78	15	1	3	3	8	0.52	52.00
8	Owner interference	Client	74	16	1	3	3	7	0.49	49.33
9	Delay in change orders by client	Client	60	18	4	2	2	4	0.40	40.00
10	Poor financial control mechanism	Client	95	9	4	3	1	13	0.63	63.33

Table No. 2: Causes of Overrun

It is observed that in the table Responsible Authority and Person is client. The 10 causes of overrun is here. Addition of total respondents and frequencies of respondents is given in the table. The percentage of each cause is calculated by RII method, the highest percentage 63.33% for cause poor financial control mechanism and lowest percentage is 40% for delay in change orders by client.

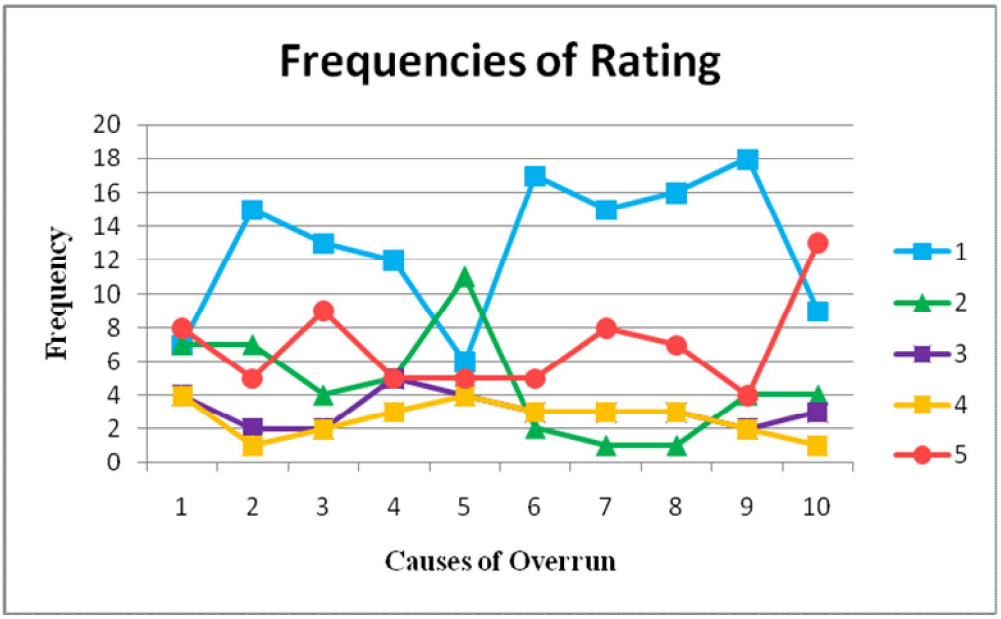

Figure No. 1: Frequencies of Rating for Client

It is observed that in the graph is frequencies of rating for client. The frequencies of rating for 10 causes of overrun are here. On X-axis causes of overrun is plotted and on Y-axis frequency is plotted. In this graph 5 frequencies show of 30 respondents. The rating of frequency no 1 is show in blue color is high and frequency no 4 show in yellow color is low.

Sr. No.	Cause Of Overrun	Responsible Authority and Person	RII	Ranking
10	Poor financial control mechanism	Client	0.63	1
1	Delay in progress payments	Client	0.59	2
5	Unrealistic contract duration	Client	0.54	3
3	Frequent change orders during construction by client	Client	0.53	4
7	Delay in decision making process	Client	0.52	5
4	Late in approving design documents	Client	0.49	6
8	Owner interference	Client	0.49	7
6	Work suspension by clients	Client	0.45	8
2	Delay in delivering the site to the contractor	Client	0.43	9
9	Delay in change orders by client	Client	0.40	10

Table No. 3: Causes of Overrun Ranking for Client

It is observed that in the table causes of overrun ranking for client. The 10 causes of overrun is here. Addition of total respondents and then calculate RII of each cause and their percentage and ranking of causes. First rank is Poor financial control mechanism for RII 0.63 and last rank is delay in change orders by client for RII 0.40.

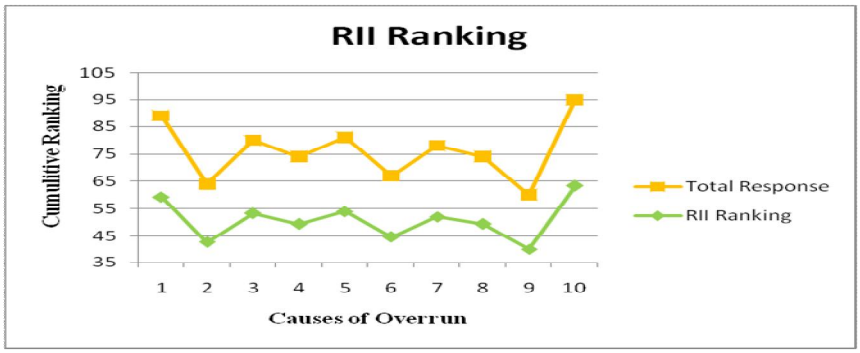

Figure No. 2: RII Ranking for Client

It is observed that in the graph is RII ranking for client. The frequencies of rating for 10 causes of overrun are here. On X-axis causes of overrun is plotted and on Y-axis cumulative ranking is plotted. In this graph total response and RII ranking are plotted.

X. CONCLUSION

The research focused on studying cost development over time by referring the three case study projects. Most of the projects registered cost deviation at the planning phase. The result from the sets of projects considered showed large cost deviation.

A. The first three factors ranked by RII method first is conflict between labour, second lack of sub-contractor skills and third is poor financial control mechanism. The first one conflict between labour in the category of labour its RII is 0.70, second one lack of sub-contractor skills in the category of contractor its RII is 0.68 and third one poor financial control mechanism in the category is client its RII is 0.63.

B. Te severity index and frequency index of the factors are, for conflict between labour is 70.00, for lack of sub-contractor skills is 68.00 and for poor financial control mechanism is 63.33.

C. The average of percentage excess for case study 1 is 1.02 and percentage saving is 1.10. The average of percentage excess for case study 2 is 2.71 and percentage saving is 4.39. The average of percentage excess for case study 3 is 1.90 and percentage saving is 0.15.

D. The average percentage cost growth rate for all three case studies is 98.62% and average actual cost percentage change for all three case studies is 97.20%.

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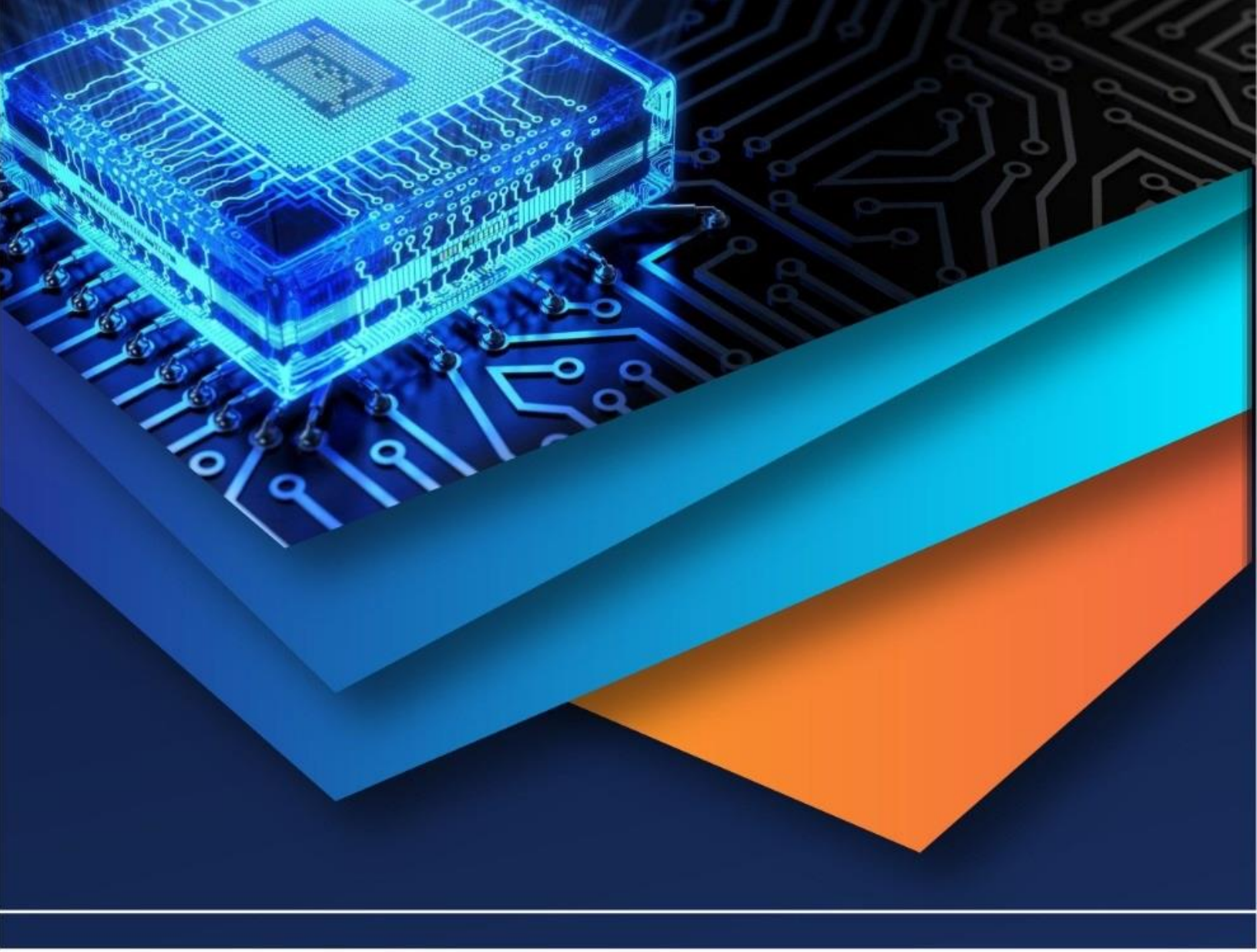

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