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INVESTIGATION OF FACTORS AFFECTING INFRASTRUCTURE PERFORMANCE USING ANALYTICAL HIERARCHY PROCESS (AHP)

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Abstract*— Due to increasing competition between construction companies and changing demands on the type and quality of construction projects in the last two decades, the significance of execution the board has been altogether raised. Therefore, in the ongoing years a requirement for a complete arrangement of performance management has been distinguished for development associations. Therefore, identification and analysis of factors that affect infrastructure project performance. This factor also helps the managers to take an analytical decision. 40 factors were identified under 6 main group. 89 questionnaires were distributed and out these 60 (67.41%) is responded and it is believed to be adequate for analysis. For examination, diagnostic progression process (AHP) was use.

Keywords*— Include Infrastructure Project, Project Performance, Analytical Hierarchy Process, Performance Indicators, Construction Project

I.INTRODUCTION

General Development of construction industry assumes a noteworthy job being developed and accomplishment the objectives of society. Construction industry has multifaceted nature in its inclination since it contains huge number of parties as customers, contractual workers, experts, partners, investors and controllers. In recent years, Indian construction industry has been gain good progress, estimated higher growth than previous years. Therefore, it is important for the mangers to track the performance of the resources. More over Indian government allow 100% Foreign direct Investment (FDI) in construction industry, in competence environment it is advisable to track own performance and try to coupe up with rival companies. It also helps managers to decide future planning and strategies with systematic and formal way to evaluate the performance and its causes.
Okuwoga stated that Performance of construction industry is considered as wellspring of worry about Public and Private Players. Over period to measure performance, there were many new method presented with consideration of financial and non-financial parameters. The concept of performance measurement first proposed in 1940s by New York Bureau of municipal research as a budgetary system and after that, it adopted in accounting system to measure financial parameters**.** first generation of performance measurement systems, (PMS) based on financial parameters, second generation PMS based on to address the weakness of first generation, and third generation was developed to link financial and non-financial parameters. **(10)**

II.OBJECTIVE OF STUDY

Main Objective of the research work listed below
1. To study performance management concept
2. To determine the contractors and consultants perceptions towards the relative importance key performance Indicators.
3. To recommend key points to drive that and enhance the performance of project.
4. To provide rank for the factors in all categories.

III.RESEARCH METHODOLOGY

First the factors were divided in six main perspective which were Financial factors, Time related factors, client related factors, Internal business process, learning growth and innovation, Health safety and environmental. Furthermore, based on nature of construction industry and literature review process sub-parameters were decided. The aim of the survey or questionnaire is to explore the validity of the selected performance measures and indicators by distributing it among the companies and professionals working in the industry. Collected responses will be analyse using analytical hierarchy process

IV.ANALYTICAL HIERARCHY PROCESS

The analytic hierarchy process (AHP) is an organized procedure for sorting out and breaking down complex choices. Based on mathematics and psychology, it was created by Thomas L. Saaty during the 1970s and has been broadly considered and refined from that point forward.
Users of the AHP first break their choice issue into a chain of importance of all the more effectively grasped sub-issues, every one of which can be broke down freely. The components of the chain of command can identify with any part of the

choice issue substantial or impalpable, deliberately estimated or generally evaluated, well or ineffectively comprehended anything at all that applies to the current choice. When the progression is constructed, the leaders methodically assess its different components by contrasting them with each other, two at any given moment, regarding their effect on a component above them in the chain of importance. In making the correlations, the leaders can utilize solid information about the components, however, they normally utilize their decisions about the components' relative significance and significance. It is the substance of the AHP that human decisions, and not simply the hidden data, can be utilized in playing out the assessments. The AHP changes over these assessments to numerical qualities that can be prepared and looked at over the whole scope of the issue. A numerical weight or need determined for every component of the chain of importance, enabling differing and regularly incommensurable components to be contrasted with each other in a normal and reliable manner. This capacity recognizes the AHP from other basic leadership strategies.

V.DATA COLLECTION AND DATA ANALYSIS

Two type of stakeholder targeted, contractor and consultants. Total 89 questionnaires were distributed to different respondents. Total 60 respondents provided their response for this research work that shows in table: I. Response rate of this survey is 67.41%

TABLE I : Respondents Details

Stakeholders	Ahmadabad
Consultant	20
Contractor	40
Total	60

A. ***Frame work for factors affecting infrastructure project performance***

Here whole framework divided into 6 main groups. Another 40 factors grouped into 6 main factors. 6 main factors are financial factors, Internal Business factors, Learning growth and innovation factors, Client factors, Health safety and environmental factors, time factors. By using AHP method, we got the results as per table: II

TABLE III: Weights of factors

Global Weights						
Sr.	Criteria	Local Weights	Sub- Criteria	Local Weights	Global Weights	Rank
1	Financial Factors	23.43%	Profitability	11.97%	2.804571%	11
			Project cash flow	10.23%	2.396889%	16
			Project budget	5.27%	1.234761%	26
			ROI	19.13%	4.482159%	7
			Interest cost	9.30%	2.178990%	19
			Cash liquidity	9.27%	2.171961%	20
			Escalation of material	11.27%	2.640561%	12
			Overtime cost	9.37%	2.195391%	18
			Cost of variation	7.13%	1.670559%	22
			Rework cost	7.07%	1.656501%	23
2	Internal Business factors	10.40%	Employee's satisfaction level	7.10%	0.738400%	37
			Appraisal system	11.83%	1.2303200%	27
			Degree of project teamwork	5.80%	0.603200%	39
			Selection of project teamwork	23.57%	2.4512800%	14
			project quality level	10.93%	1.1367200%	29
			machinery and manpower productivity	10.93%	1.1367200%	29
			flexibility in internal process	10.67%	1.1096800%	32
			project manager's competence	19.20%	1.996800%	21

3	Learning, Growth and Innovation factors	6.53%	Investment in R&D	11.93%	0.77902900%	35
			Technological enhancement	11.40%	0.7444200%	36
			Process innovation	12.13%	0.79208900%	34
			Competitiveness	12.80%	0.8358400%	33
			Cost control techniques	17.23%	1.12511900%	31
			Training process	9.27%	0.60533100%	38
			Award for work	7.77%	0.50738100%	40
			Automation process	17.53%	1.14470900%	28
4	Client factors	23.33%	Client satisfaction	46.73%	10.90210900%	1
			Trust and respect	19.17%	4.47236100%	8
			Harmonious working relationship	24.07%	5.61553100%	3
			Number of dispute occurred	10.10%	2.3563300%	17
5	Health, safety and Environmental Factors	19.37%	No of health and safety issue	25.13%	4.86768100%	6
			Socio-environmental complaints	20.73%	4.01540100%	9
			Air quality	13.00%	2.518100%	13
			Accident rate	25.67%	4.97227900%	5
			Construction waste reuse	15.43%	2.98879100%	10
6	Time factors	17.00%	Site preparation time	14.40%	2.44800%	15
			planned time for the project	30.20%	5.13400%	4
			time taken to rectify the defect	7.27%	1.235900%	25
			delay in claim approval	8.43%	1.433100%	24
			availability of resources	39.60%	6.73200%	2

From the following table we can identify the top ten criteria that affect infrastructure project performance are as per table: III and figure: I with its criteria weights.

TABLE IIIII: Top ten criteria with its global factor

Rank	Criteria	Global Criteria Weights
1	Client satisfaction	10.90210900%
2	Availability of resources	6.73200%
3	Harmonious working relationship	5.61553100%
4	Planned time for the project	5.13400%
5	Accident rate	4.97227900%
6	No of health and safety issue	4.86768100%
7	Return of Investment	4.482159%
8	Trust and respect	4.47236100%
9	Socio-environmental complaints	4.01540100%
10	Construction waste reuse	2.98879100%

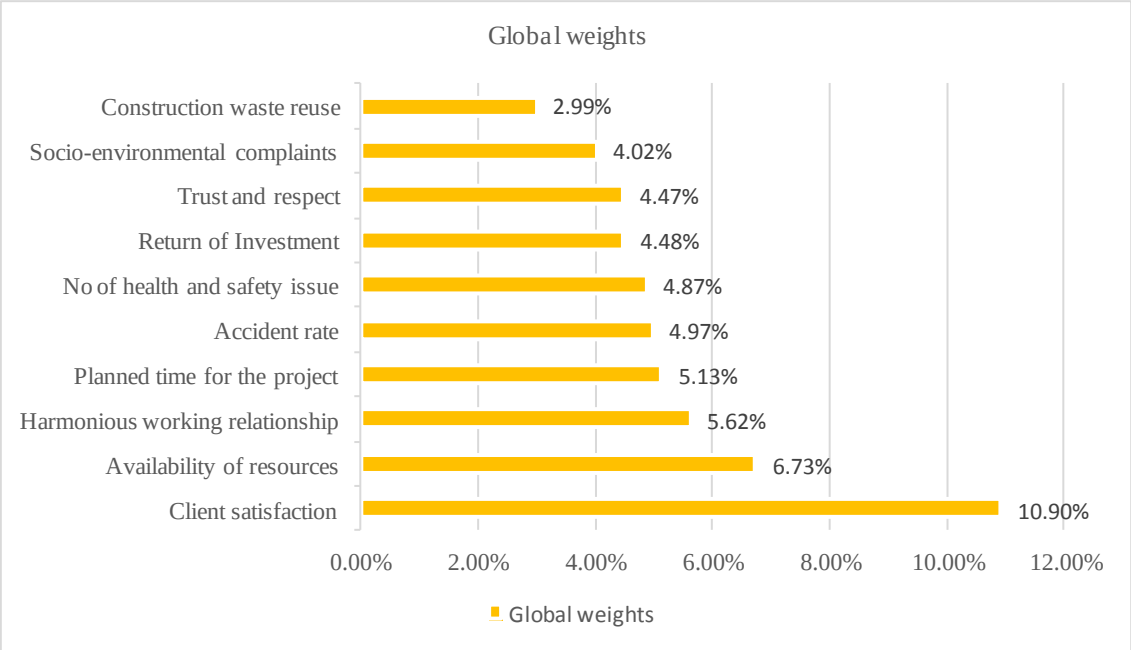

Figure I: Top Ten Factors Affecting Infrastructure Project Performance

VI. CONCLUSIONS

The main aim of the study is too identified and analyzes the factors affecting infrastructure project performance. Total forty factors considered in the study, which were categorized in six main groups as financial factors, internal business factors, Learning growth and innovation factors, Client factors, Health safety and environmental, Time factors.
The top the factors, which affect the most out of forty factors, are Client satisfaction, Availability of resources, Harmonious working relationship, Accident rate, No of health and safety issue, Return of Investment, Trust and Respect, Socio-environmental complaints, construction waste reuse. Here one things to identify is that only financial factors are not important in infrastructure projects.

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