Performance Factor Analysis of Construction Projects in Nashik City

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Abstract— A number of studies has been conducted to examine factors affecting on project performance in developing countries. The construction industry is complex in its nature because it comprises large number of parties as owners (clients), contractors, consultants & regulators. Contractors have to be capable of continuously improving their performance. The first step involves general information collection, including both first-hand and second-hand data, in order to identify major themes from the literature. Surveys and interviews are conducted, in which a list of important factors for successful performance are identified. With these factors, experts interviews, conducted in second step, are used to decide the most significant factors among them. The main purpose is to improve the performance of construction achieving the economy and give the satisfaction to the construction.

Key words: Construction, Nashik City

I. Introduction

A number of studies have been conducted to examine factors affecting on project performance in developing countries. With increasing higher users requirements environmental awareness & limited resources on one side & high competition for construction business market place on other side. Contractors have to be capable of continuously improving their performance. The construction industry is complex in its nature because it comprises large number of parties as owners (clients), contractors, consultants& regulators. Despite this complexity, the industry plays a measure role in development & achievement of society's goals. However, many local constructions project report poor performance due to many evidential project-specific causes such as: unavailability of materials, excessive amendments of design &drawings, poor coordination among participants, ineffective monitoring & feedback & lack of leadership skills. The ever-important macro-level political & economic factors have also been related to poor project performance. Project performance can be measured & evaluated using a large number of performance indicators that could be related to various groups such as cost, time, quality, productivity, client satisfaction, health safety, innovation &learning, environmental. Time, cost& quality are predominant performance evaluation groups.

II. Methodology

This project includes four major steps. The first step involves general information collection, including both first-hand and second-hand data, in order to identify major themes from the literature. Surveys and interviews are conducted, in which a list of important factors for successful performance are identified. With these factors, experts interviews, conducted in second step, are used to decide the most significant factors among them. The third step is the case study to show the importance of those factors and how they work in the construction field. The last step is the conclusions and suggestions for researcher or practitioners. A questioner survey was used to elicit the attitude of owners, consultant and contractors towards the factor affecting the performance of construction in Nasik city.

III. Literature Review

Construction industry faces challenges with regard to problem associated with productivity and the problem are usually associated with performance of labour. Efforts to produce the better performance and increasing productivity in construction requires an understanding of the various indicators of productivity as a path to understanding the performance of the project.

The high-risk nature of construction projects has led to many cost overruns in the history of construction. Therefore, contractors should use a systematic approach to manage risks on a project. The first step in managing risk is the identification of risk sources. The risk sources can be gathered into two groups: controllable and uncontrollable factors. Since contractors are more familiar with the controllable risk sources, this paper has concentrated on the uncontrollable risk sources. The uncontrollable risk sources should be considered during the estimating stage as there is a limited way of managing them once construction starts. This paper provided an overview of uncontrollable factors and explained the relationship among these factors and cost overburden components. (2)

Quality is nothing but satisfaction with the appearance, performances, and reliability of the project for a given price range. Compliance with quality specifications is an important performance measure of any construction project. The repercussions and consequences of poor quality can be a loss in productivity; additional expenditure by way of rework and repair; loss of reputation, leading to loss in market share; and eventually being put out of business.(6)

The survey conducted on the 22 building projects showed that the most critical risk factors affecting both project time and cost were similar. They were: high inflation/ increased price, design change by owner, defective design, and delayed payments on contract, weather condition and defective construction work. Most of these risk factors cannot be controlled or managed by the contractors and yet contractors working on most Indonesian construction contracts will be expected to accept the risks relating to inflation, delayed payments, defective construction work and to take some responsibility for adverse weather conditions.(4)

Customer satisfaction and performance measurement have gained considerable attention amongst both academics and practitioners in the last few years. customer satisfaction has become an essential part in the construction industry. This paper examines customer satisfaction through factor analysis. The purpose of this

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paper is to explore empirically contractor's performance as perceived by customers. Customer orientation has become increasingly important in construction. This article has investigated customer satisfaction in the construction. The importance of customer satisfaction and its relation to project success and customer based quality has been established widely in the construction industry, especially, in the last few years. (15)

IV. DATA COLLECTION

The first step includes a formal survey process are defining the factors that affect on the performance of construction and in the second step determine the demographic data and most important factors which affect on performance of construction industry in Nasik city. Participants are pre-selected and thus the response rate and accuracy are expected to be high. There are 10 total factors and 5 questions included on the survey.

For several of the factors list of important factors which mostly affect on the: performance of construction are identified, other questions are designed to solicit input with regard to identifying key factors.

We visited some builders& consultants and after having discussion with them we have found some more factors which affect on the performance of construction.

V. ANALYSIS & RESULTS

Analysis of data and results will be shown and elaborated by using frequency analysis and average analysis. Construction organizations were randomly selected as the targeted respondent to determine factors that affect on performance of construction through questionnaire survey. The organization will include civil and structure/building consultant and project management consultant. Coverage of such organization was hoped to represent the local construction industry more comprehensively. Among 111 sets of questionnaires forms distributed, there were 100 sets of replied with completed questionnaires form that cover 90% of the total 111 sets questionnaires form in the study.

Frequency analysis will be using tabular form to represent result of data analysis of frequency of response that respondent give to the different variables in the questionnaires. The result was tabulated in the form of frequency numbers and percentage according to total respondents.

Where,

$$\frac{\sum}{\sum}$$

X1 = no of respondents for not important.
X2 =no of respondents for less important.
X3 = no of respondents for average.
X4 = no of respondents for important.
X5 = no of respondents for very important.

Level of importance of factors affect on performance of construction.

A. *Cost factor*

0	1		2		3		4		5		Total		Averag e	Categor y	Relativ e	R a
	Fre q	%	Fre q	%	Fre q	%	Fre q	%	Fre q	%	Fre q	%	Index		Index	
Cash flow of project	0	0.0 0	0	0	6	6.00	36	36.0 0	58	58.0 0	100	10 0	4.5200	Very Importa nt	0.9040	
Profit rate	0	0.0 0	3	3	20	20.0 0	49	49.0 0	28	28.0 0	100	10 0	4.0200	Importa nt	0.8040	
Overhea d % of project	0	0.0 0	9	9	23	23.0 0	45	45.0 0	23	23.0 0	100	10 0	3.8200	Importa nt	0.7640	
Project design cost	2	2.0 0	2	2	12	12.0 0	46	46.0 0	38	38.0 0	100	10 0	4.1600	Importa nt	0.8320	
Material & equipme nt cost	1	1.0 0	2	2	11	11.0 0	46	46.0 0	40	40.0 0	100	10 0	4.2200	Importa nt	0.8440	
Project labour cost	0	0.0 0	4	4	11	11.0 0	46	46.0 0	39	39.0 0	100	10 0	4.2000	Importa nt	0.8400	
Wastage	2	2.0	10	1	41	41.0	30	30.0	70	70.0	100	10	4.0196	Importa	0.8039	

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rate of material		0		0		0		0		0		0		nt		
Regular project budget update	0	0.00	10	10	29	29.00	45	45.00	16	16.00	100	100	3.6700	Important	0.7340	
cost control system	0	0.00	7	7	28	28.00	42	42.00	23	23.00	100	100	0.0000	Not Important	0.0000	
Escalation of material prices	0	0.00	8	8	22	22.00	46	46.00	24	24.00	100	100	0.0000	Not Important	0.0000	1
cost of rework	2	2.00	14	14	20	20.00	47	47.00	17	17.00	100	100	0.0000	Not Important	0.0000	1
Average													2.97		0.5933	

Table 1: Cost factor

Majority of respondents agree that cost factor is very important with the average index and highest relative index. This is followed by the cash flow of project (relative index 0.9040), profit rate (relative index 0.8040).

B. Time factor

Time Factor	1		2		3		4		5		Total		Average	Category	Relative	Ra
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Index		Index	
Site Preparation Time	1	1.00	6	6	18	18.00	63	63.00	12	12.00	100	100	3.7900	Important	0.7580	
Planned time for Construction	0	0.00	2	2	26	26.00	52	52.00	20	20.00	100	100	3.9000	Important	0.7800	
% Of order delivered late	2	2.00	2	2	26	26.00	48	48.00	22	22.00	100	100	3.8600	Important	0.7720	
Time needed to impliment order	1	1.00	10	10	17	17.00	49	49.00	23	23.00	100	100	3.8300	Important	0.7660	
Time Needed to rectify defects	1	1.00	8	8	18	18.00	52	52.00	21	21.00	100	100	3.8400	Important	0.7680	
Avg. delay in regular payments	2	2.00	8	8	26	26.00	46	46.00	18	18.00	100	100	3.7000	Important	0.7400	
Unavailability of resources	2	2.00	3	3	12	12.00	39	39.00	44	44.00	100	100	4.2000	Important	0.8400	
Design Change By Owners	1	1.00	6	6	18	18.00	38	38.00	37	37.00	100	100	4.0400	Important	0.8080	
Delay due to strike	8	8.00	23	23	31	31.00	28	28.00	10	10.00	100	100	0.0000	Not Important	0.0000	
Holidays of labour	8	8.00	28	28	28	28.00	24	24.00	12	12.00	100	100	0.0000	Not Important	0.0000	1
e to unclear & inadequate details i	2	2.00	10	10	20	20.00	39	39.00	0	0.00	100	100	0.0000	Not Important	0.0000	1
Average													2.8327	Average	0.5666	

Table 2: Time factor

Majority of respondents agree that unavailability of resources factor is very important to the performance with the average index 4.2000 and highest relative index 0.8400. This is followed by design change by owner (relative index0.8080),planned time for construction(relative index0.7800.

C. Quality factor

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	Quality Factor	1		2		3		4		5		Total		Average	Category	Relative	Rank
no.		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Index		Index	
1	Conformance to specification	0	0.00	2	2	16	16.00	62	62.00	20	20.00	100	100	4.0000	Important	0.8000	3
2	Unavailabilty of Competent Staff	2	2.00	1	1	15	15.00	57	57.00	25	25.00	100	100	4.0200	Important	0.8040	2
3	Quality Of Materials & Equipment	0	0.00	1	1	10	10.00	36	36.00	53	53.00	100	100	4.4100	Important	0.8820	1
4	Quality Training	0	0.00	6	6	35	35.00	38	38.00	21	21.00	100	100	3.7400	Important	0.7480	4
	Average													4.0425	Important	0.8085	

Table 3: Quality factor

Majority of respondents agree that quality of materials and equipment is very important to performance with the average index 4.4100 and highest relative index 0.8820 . This is followed by unavailability of competent staff (relative index 0.8040),conformance to specification(relative index 0.8000).

D. Customer satisfaction

Sr	Customer Satisfaction	1		2		3		4		5		Total		Average	Category	Relative	Rank
no.		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Index		Index	
1	cordination	0	0.00	0	0	8	8.00	52	52.00	40	40.00	100	100	4.3200	Important	0.8640	1
2	eed & reliability of service to own	0	0.00	2	2	23	23.00	54	54.00	21	21.00	100	100	3.9400	Important	0.7880	3
3	No.of disputes between owner & project parties	0	0.00	8	8	29	29.00	41	41.00	22	22.00	100	100	3.7700	Important	0.7540	4
4	No.of rework incidents	1	1.00	10	10	30	30.00	37	37.00	22	22.00	100	100	3.6900	Important	0.7380	6
5	Giving possesion in time	0	0.00	3	3	9	9.00	46	46.00	42	42.00	100	100	4.2700	Important	0.8540	2
	Average													3.9980	Important	0.7996	

Table 4: Customer satisfaction

Majority of respondents agree that co-ordination is very important to performance with the average index 4.3200 and highest relative index 0.8640. This is followed by giving possession in time (relative index 0.8540),need and reliability of service to owner(relative index 0.7880).

E. Health and safety

Sr	Health & Safety	1		2		3		4		5		Total		Average	Category	Relative	Rank
no.		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Index		Index	
1	on Of health & safety factors in or	0	0.00	1	1.00	9	9.00	48	48	42	42.00	100	100	4.3100	Important	0.8620	2
2	Project location is safe to reach	1	1.00	9	9.00	24	24.00	48	48	18	18.00	100	100	3.7300	Important	0.7460	4
3	Accident Rate in Project	1	1.00	5	5.00	28	28.00	40	40	26	26.00	100	100	3.8500	Important	0.7700	3
4	Providing safety equipments	0	0.00	3	3.00	10	10.00	33	33	54	54.00	100	100	4.3800	Important	0.8760	1
	Average											100	100	4.0675	Important	0.8135	

Table 5: Health and safety

Majority of respondents agree that providing safety equipment's is very important to performance with the average index 4.3800 and highest relative index 0.8760. This is followed by application of health and safety factors in organization (relative index 0.8620),accident rate in project(relative index 0.7700).

F. Environmental factors

Environmental Factor		1	2		3	4	5		Total	Average	Category	Relative	Rank

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	Freq	%	Freq	%	Freq	%	Freq	%	Freq		%	Freq	%	Index		Index	
Noise Level	1	1	13	13.00	38	38.00	30	30	18		18	100	100	3.5100	Important	0.7020	4
Wastes Around The Site	0	0	9	9.00	36	36.00	38	38	17		17	100	100	3.6300	Important	0.7260	2
Climatic condition	2	2	7	7.00	39	39.00	39	39	13		13	100	100	3.5400	Important	0.7080	3
Availability Of natural Resources(Water)	2	2	6	6.00	13	13.00	45	45	34		34	100	100	4.0300	Important	0.8060	1
Average														3.6775	Important	0.7355	

Table 6: Environmental factors

Majority of respondents agree that unavailability of natural resources is very important to performance with the average index 4.0300 and highest relative index 0.8060. This is followed by wastage around the site (relative index 0.7260), climatic condition (relative index 0.7080).

G. *Productivity*

Sr no.	Productivity	1		2		3		4		5		Total		Average Index	Category	Relative Index	Rank
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%				
1	Project Compexity	0	0.00	4	4	15	15.00	62	62.00	19	19.00	100	100	3.9600	Important	0.7920	5
2	No. Of new project per year	1	1.00	14	14	36	36.00	39	39.00	10	10.00	100	100	3.4300	Average	0.6860	6
3	management-labour relationship	0	0.00	0	0	7	7.00	53	53.00	40	40.00	100	100	4.3300	Important	0.8660	1
4	uencing of work According to sche	0	0.00	1	1	15	15.00	44	44.00	40	40.00	100	100	4.2300	Important	0.8460	2
5	Labour productivity	1	1.00	0	0	12	12.00	50	50.00	37	37.00	100	100	4.2200	Important	0.8440	3
6	appointment of sub-contractor	0	0.00	2	2	19	19.00	57	57.00	22	22.00	100	100	3.9900	Important	0.7980	4
	Average													4.0267	Important	0.8053	

Table 7: Productivity

Majority of respondents agree that management-labor relationship is very important to performance with the average index 4.3300 and highest relative index 0.8660. This is followed by sequencing of work according to schedule (relative index 0.8460),labour productivity (relative index 0.8440).

H. *Market condition*

Sr no.	Market Condition	1		2		3		4		5		Total		Average Index	Category	Relative Index	Rank
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%				
1	Market Response	0	0.00	1	1	55	55.00	56	56.00	38	38.00	100	100	3.8733	Important	0.7747	1
2	Social imbalance	1	1.00	4	4	27	27.00	54	54.00	14	14.00	100	100	3.7600	Important	0.7520	2
3	New Rules & Regulation	0	0.00	10	10	28	28.00	38	38.00	24	24.00	100	100	3.7600	Important	0.7520	3
	Average													3.7978	Important	0.7596	

Table 8: Environmental factors

Majority of respondents agree that market response is very important to performance with the average index

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3.8733 and highest relative index 0.7747. This is followed by social imbalance (relative index 0.7520), new rules and regulations (relative index 0.7520).

Government laws and sanctioning

Sr no.	Government Laws & Sanctioning	1		2		3		4		5		Total		Average Index	Category	Relative Index	Rank
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%				
1	Sanitary disposal	0	0.00	4	4	25	25.00	34	34.00	37	37.00	100	100	4.0400	Important	0.8080	3
2	Approvals	0	0.00	0	0	9	9.00	48	48.00	43	43.00	100	100	4.3400	Important	0.8680	2
3	Environmental Clearance	1	1.00	2	2	3	3.00	37	37.00	50	50.00	100	100	4.4301	Important	0.8860	1
	Average													4.2700	Important	0.8540	

Table 9: Government laws and sanctioning

Majority of respondents agree that environmental clearance is very important to performance with the average index 4.4301 and highest relative index 0.8860. This is followed by approvals (relative index 0.8680), sanitary disposal (relative index 0.8080)

I. People factor

Sr no.	People Factor	1		2		3		4		5		Total		Average Index	Category	Relative Index	Rank
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%				
1	Employee Attitude	1	1.00	1	1	6	6.00	64	64.00	28	28.00	100	100	4.1700	Important	0.8340	2
2	Employee Motivation	0	0.00	15	15	21	21.00	49	49.00	15	15.00	100	100	3.6400	Important	0.7280	3
3	Coordination	0	0.00	2	2	14	14.00	48	48.00	36	36.00	100	100	4.1800	Important	0.8360	1
4	Belonging To Work	4	4.00	8	8	23	23.00	55	55.00	10	10.00	100	100	3.5900	Important	0.7180	4
5	Theft	8	8.00	26	26	39	39.00	18	18.00	9	9.00	100	100	2.9400	Average	0.5880	5
	Average													3.7040	Important	0.7408	

Table 10: People factor

Majority of respondents agree that co-ordination is very important to performance with the average index 4.1800 and highest relative index 0.8360. This is followed by employee's attitude (relative index 0.8340), employee motivation (relative index 0.7280), belonging to work (relative index 0.7180)

VI. CONCLUSION & RECOMMENDATIONS

"Cost Factor", "Time Factor", "Quality", "Health & Safety", "Productivity", "Customer satisfaction", "Govt. laws &Sanctioning", "People Factors", "Environmental Factors", "Market conditions". These are main factors that affect performance of construction.

There are topmost 25 Factors affecting performance of construction rated by respective builders and consultants. In the questioners in which there are top 25 factors are as follows:

Factors	Rank	Relative Index	Main Factor
Cash flow of project	1	0.9040	Cost Factor
Environmental Clearance	2	0.8860	Govt. Laws & Sanction
Quality Of Materials & Equipment	3	0.8820	Quality
Providing safety equipment's	4	0.8760	Health & Safety
Approvals	5	0.8680	Govt. Laws & Sanction
management-labour relationship	6	0.8660	Productivity
Coordination	7	0.8640	Customer Satisfaction
Application Of health & safety factors in organization	8	0.8620	Health & Safety
Giving possession in time	9	0.8540	Customer Satisfaction
Sequencing of work According to schedule	10	0.8460	Productivity
Labour productivity	11	0.8440	Productivity
Material & equipment cost	12	0.8440	Cost Factor
Project labour cost	13	0.8400	Cost Factor
Unavailability of resources	14	0.8400	Time
Coordination	15	0.8360	People
Employee Attitude	16	0.8340	People
Project design cost	17	0.8320	Cost Factor
Sanitary disposal	18	0.8080	Govt. Laws & Sanction
Design Changes By Owner	19	0.8080	Time
Availability Of natural Resources(Water)	20	0.8060	Environmental
Unavailability of	21	0.8040	Quality

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Competent Staff			
Profit Rate	22	0.8040	Cost Factor
Wastage rate of material	23	0.8039	Cost Factor
Conformance to specification	24	0.8000	Quality
Appointment of sub-contractor	25	0.7980	Productivity

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