International Research Journal of Management and Commerce
ISSN: (2348-9766)
Impact Factor- 5.564, Volume 4, Issue 8, August 2017
Website- www.aarf.asia, **Email** : editor@aarf.asia , editoraarf@gmail.com

CAUSES OF DELAY IN INFRASTRUCTURE PROJECTS: AN EMPIRICAL STUDY IN TRI-CITY OF CHANDIGRAH, MOHALI AND PANCHKULA

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ABSTRACT

Purpose – *The objective of the study is to explore the causes of delay in infrastructure projects. Further, the aim is to observe the level of agreement of the perception of academicians/ researchers vis-à-vis practitioners regarding these causes of delays. Lastly, the ranking of these causes of delays has been done on the basis of the perception of the respondents*.

Research Design- *For the purpose of data collection, a questionnaire survey was administered among respondents to elicit the causes of delay. Respondents were selected on the basis of convenient sampling technique from the tri-city of Chandigarh, Mohali and Panchkula. Using relative importance index, the identified causes of delays were ranked according to the importance given by the respondents.*

Findings– *It was found that first five delay causes which are significantly important are, namely, high interest rates, poor liquidity in financial markets, low labour output, Cash flow problems of sub-contractors and utilities. The results of T-test showed that there was out of 40 factors, there exists a perceived difference among both categories that is academicians/researchers and practitioners for 17 factors.*

Practical implications *–The finding of the study would provide valuable guidance to the stakeholders of infrastructure projects. The recommendations would help them in finishing the projects in the given time duration and budgeted cost*.

Keywords- Infrastructure projects, causes of delays, RII (Relative Importance Index)

Paper type-Research paper

1. INTRODUCTION

Infrastructure is a thrust area in India today. The economic growth of a country is always dependent upon the level of infrastructure development in a particular country. Hence, observing the importance of infrastructure to the developing country like India, It is pertinent to take more and more infrastructure projects and finish them in the given time duration and budgeted cost.

Delays have become major concern as almost all the infrastructure projects are running behind time whatever reason may be. The causes of delays in these projects are projects specific. According to Bramble and Callahan [4] "a delay is the lag that can adversely affect the total project completion time of a particular project."

1.1 PROBLEM DEFINITION

The delay problems in the infrastructure projects are universal phenomenon all across the globe and hence India is not an exception to it. To deal with the issue, a lot of research has been bestowed over the causes of delays in every country. Assaf and Al-Hejji [3] observed in their study that 70% of the construction projects were found delayed and quite strangely, the average time overrun was found between 10% and 30%. Odeyinka and Yusif [14] have observed that 70% of the projects in Nigeria suffered delays. An empirical study on construction delays was done by AlMomani [2] in Jordan. Frimpong et al. [9] identified and ranked the delay factors of groundwater construction projects in Ghana on the basis of their relative importance. With an objective to identify the causes of delays in Hong Kong construction industry, Chan and Kumaraswamy [5] conducted the study and emphasized that timely delivery of projects within budget is determinant of successful project delivery.

Terry Williams [20] has tried to classify delays into three categories namely, Excusable Delay with Compensation, Excusable delay while not compensation and Non-excusable delay. According to author, Excusable delays with compensation are generally caused by the owner/owner's agents. Compensable delays may arise because of lack of or late information the client, design change by client to name a few. In such types of delays, the contractor generally gets breather in the form of an extension of time along with costs compensation too. Second types of delays are beyond the control of both the owner and the contractor. It can be all because of acts of God, unusual weather conditions, earthquake, Tsunami, strikes, fires etc. In such cases, the contractor is generally given a time extension. The Third types of delays are called Non-excusable delays, and are caused solely by the contractor. The contractor is not given any kind of relief in such cases.

It has been found that delay entails additional cost factor. In normal practice, for this additional cost factor there is no adjustment made between client and the contractor. Hence, this factor creates disputes between client and contractor which in turn aggravates the dissatisfaction among all other stakeholders-banks and financial institution, equity sponsors-to name a few. Moreover, it can result in disagreement, grievance, distrust and litigation, in turn may lead to adversely affect the interest of a particular stakeholder or to the whole project in toto. Hence, a need was felt to identify the causes of delays in infrastructure projects. With a view of achieve these objectives, the present study is a focus to explore the causes of delays in infrastructure projects. Further, the aim is to observe the level of agreement of the perception of academicians/ researchers vis-à-vis practitioners regarding these causes of delays. Lastly, the ranking of these causes of delays has been done on the basis of the perception of the respondents.

This paper is organized into five parts. Section one discusses about the Introduction part. Section two proceeds with the review of literature about the causes of delays in infrastructure projects. Section three takes up the research design. Section four explains the results and discussion of the data analysis. Lastly, the Section five takes up the conclusions, limitations and practical implications.

2. REVIEW OF LITERATURE

Review of the literature is bifurcated into two categories, namely, international and national studies.

International studies

Sambasivan & Soon [18] identified the causes of delays in infrastructure projects and their impact on project completion. Using questionnaire survey to elicit the causes and effects of delay from respondents, ten most important causes of delays-contractor's improper planning, contractor's poor site management, inadequate contractor experience, inadequate client's finance and payments for completed work, problems with subcontractors, shortage in material, labor supply, equipment availability and failure, lack of communication between parties, and mistakes during the construction stage were found from the study. Six main effects of delays-time overrun, cost over-run, disputes, arbitration, litigation, and total abandonment were found by the authors.

Saleh et al. [21] focused on specific causes of delay i.e. poor coordination and ineffective communication. Using questionnaire survey in Benghazi city in Libya and by application of mean value criterion on data, five factors-improper planning, lack of effective communication, shortage of supply, slow decision making & financial Issues and shortage of material-were ranked on the basis of importance respectively.

Rahsid, Y. et al. [16] focused to identify the causes of delay in construction projects. Further, the effect of various delaying factors on delay in constructions projects was observed. Using structured questionnaire from 37 construction firms in Punjab province of Pakistan, it was found that the factors except the factors related to labor and general environment, all other factors have had significant effect on delay.

Chidambaram R., [6] explored the delay factors causing risk on time and cost. For achieving the objectives, these factors were categorized into eighteen different categories, and data was collected using questionnaire surveys among different groups. Using Importance Index, Frequency Index, Severity Index and Relative Importance Index, these factors were ranked. It was found that the ranking across different groups significantly differed.

Ali, Azlan Shah et al. [1] focused to identify the causes of delay in construction projects. Further ranking of the causes of delay and their effect was observed. One hundred questionnaires were distributed out of which 36 responses were received. Out of seven factors identified through literature review, three factors- labour shortage, contractors' financial difficulties and construction mistakes & defective works-were found most important.

Kasimu & Abubakar, [11] aimed at exploring the causes of delay in construction industry of Nigeria. Using questionnaire among different categories-contractors, clients and consultants–of respondent and by application of ranking analysis, it was found that factors-improper planning, lack of communication, design errors and shortage of supply-were ranked high according to the relative importance according to perception of the respondents.

Henry, Alinaitwe et al. [10] conducted a study to investigate the causes of delays and cost overruns in construction project in Uganda's public sector units. Further, the study aimed at observing the relationship between the causes of delays and causes of cost over-run. By the application of tools like frequency index, severity index and importance index, twenty causes of delays were ranked. Further, case study approach was used so as to confirm to the results of survey. For this purpose, the Civil Aviation Authority (CAA) was opted. The five causes of delays- changes to the scope of work, delayed payments, poor monitoring and control, the high cost of capital and political insecurity and instability-in construction were found the most important. A moderate relationship was found between cause of delays and causes of cost overruns.

Mitra and Tan [13] focused to observe the issues pertaining to project management in construction project in Saudi Arabia. Using a structured questionnaire from the various team members of a particular project, it was found that the factors related to human, project tool & methods, supply chain and finance had sifnifacnt impact on overall project execution.

National studies

Ram Singh, special article Economic and political Weekly [17] emphasized the delays as one of the critical factor for the cost overruns. Further, the researcher observed that bigger projects were more prone to much higher cost overruns vis-a-vis smaller ones. When it came to sector-wise analysis, road, railways, urban-development sectors, civil aviation, shipping and ports, and

power were found more vulnerable to much longer delays via-a-vis other sub-sectors. The results indicated that both-imperfect techniques and contractual incompleteness-had impact on delays and cost overruns.

Desai and Bhatt [8] identified causes of delay in residential construction projects in central Gujarat region of India. Structured interviews technique was used for collecting data from construction projects. 59 causes of delays were found form literature and were categorized into r nine major groups. Using Relative importance index and Importance index, various factors were ranked according to the importance given by the respondents.

Taher and Pandey [19] aimed at exploring the delay causes in the planning and design phases of public construction projects in India. The objective was to rank all these causes of delays. To achieve the objective of the research, a structured questionnaire was administered to elicit the responses related to causes of delays. Using relative importance index, it was found that regular changes in client's requirement would give rise to unnecessary delays during the planning and design phases of the project.

Patil, S.K. et al. [15] conducted the research to investigate the causes of delay and their importance. For the purpose of study, the respondents were categorize into three different categories namely the owner, consultant and the contractor. Various construction projects in western Maharashtra were judges on the basis of the project performance on time parameter. The study revealed that 72% of the total projects were delivered late, whereas rest were completed on time. Clients' category indicated that 59% of the projects they were delivered late. Consultants' categories revealed that 62% of the projects were completed late. Contractors' respondents admitted that 77% of the projects were delivered late. The top five important causes of construction delays- land acquisition, environmental concers, financial closure, change requirements of the client, improper site management and supervision by contractor-were found in these projects.

Desai and Desale [7] explored the list of construction causes of delays in residential construction projects in Nashik city. A triangular approach of review of literature, Interview technique and questionnaire was adopted for the data collection purpose. Using questionnaire survey among different categories of respondents and by use of Frequency index, importance index, twenty causes of delay were explored.

3. RESEARCH DESIGN

The present study "Causes of Delay in Infrastructure Projects: An Empirical Study in Tri-City of Chandigrah, Mohali And Panchkula" is an attempt to identify the causes of delays in infrastructure projects. The research design used for the study is descriptive for which structured questionnaire survey was distributed to various respondents categories-client, consultant, contractor and academicians /researchers.

3.1 SCOPE OF THE STUDY

The focus of the present study is infrastructure sector including construction projects, roads and highways, power plants, airports and railways.

3.2 UNIVERSE AND ITS DESCRIPTION

For the present study, the universe includes the clients, contractor, design consultant, researcher/academician engaged in research in infrastructure area.

3.3 SAMPLE AND SAMPLING TECHNIQUE

Sample was drawn from four categories: contractors, clients, consultants and academicians/researchers from tri-city of Chandigarh, Mohali and Panchkula. On the basis of judgmental sampling technique, respondent were identified and online questionnaire was mailed to them.

3.4 SAMPLE SIZE

Questionnaire was distributed to 100 respondents and finally 56 responses were received from the respondents.

3.5 DATA COLLECTION TECHNIQUE

For the data collection purpose, questionnaire technique was adopted. For structuring the questionnaire, eight categories of delays-client delays, contractor delays, designer delays, financial delays, plant delays, labour delays, material delays and other delays were identified from the review of literature. Respondent were asked to show their level of agreement with respect to these delay causes. The questionnaire comprised two sections:

(1) The first section was aimed to gather personal information of the sample respondents.

(2) The second section was related to questions related to delays and scored on Likert scales.

3.6 STATISTICAL TECHNIQUES

1. Descriptive analysis

Descriptive statistics will include mean, median, standard deviation and percentiles. Descriptive analysis would be used for the profiling of sample data.

2. T-test Independent sample

T-test Independent sample is used to analyze the differences among group means and their associated procedures (such as "variation" among and between two groups). ANOVAs are useful for comparing (testing) means of two groups (groups or variables) for statistical significance.

3. Relative importance index (RII)

RII uses the weighted average methodology to calculate the relative value on the basis of the value given by the respondents. The formula to calculate RII is as follows:

$$\text{Relative Importance Index (RII)} = \frac{\sum W}{A \times N}$$

Where $0 \leq RII \leq 1$

4. RESULTS AND DISCUSSIONS

The present study “Causes of Delay in Infrastructure Projects: An Empirical Study in Tri-City of Chandigrah, Mohali And Panchkula” is an attempt to identify the causes of delays in infrastructure projects.

Table-4.1

Type of practitioner

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Contractor	7	12.5	12.5	12.5
	Client	6	10.7	10.7	23.2
	Consultant	8	14.3	14.3	37.5
	Does not apply	35	62.5	62.5	100.0
	Total	56	100.0	100.0	

From the above table 4.1, it can be observed that out of total responses, the maximum i.e. 62% is of miscellaneous one.

Table-4.2

Respondent category

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Academicians/ Researcher	35	62.5	62.5	62.5
	Practitioners	21	37.5	37.5	100.0
	Total	56	100.0	100.0	

From the above table 4.2, it can be seen that, maximum respondents i.e. 62% are from the Academician/ Researcher Category.

Table 4.3

Descriptive Statistics

	N	Range	Mean	Std. Deviation	Variance
Type of practitioner	56	3	3.27	1.087	1.181
Respondent category	56	1	1.38	.489	.239
Valid N (listwise)	56				

The above table-4.3 describes the mean and standard deviation values for the respondent category.

Table-4.4 (Result of T-Test (Independent) Sample Test)

		Levene's Test for Equality of Variances			
		F	Sig.	t	Sig. (2-tailed)
7.1 Delays are often caused by client changes	Equal variances assumed	5.734	.020	3.939	.000
	Equal variances not assumed			3.688	.001
7.2 Clients are generally slow in making decisions	Equal variances assumed	3.456	.068	2.261	.028
	Equal variances not assumed			2.113	.042
7.3 Clients are often inexperienced	Equal variances assumed	1.724	.195	-.937	.353
	Equal variances not assumed			-.892	.378
7.4 Programme periods are often too short	Equal variances assumed	.324	.572	-1.112	.271

	Equal variances not assumed			-1.120	.269
7.5 Clients frequently have cash flow problem	Equal variances assumed	2.118	.151	2.308	.025
	Equal variances not assumed			2.541	.014
7.6 Incomplete information between client and designer	Equal variances assumed	.744	.392	1.371	.176
	Equal variances not assumed			1.252	.220
8.1 lacks of experience in contractor	Equal variances assumed	.169	.683	-.443	.660
	Equal variances not assumed			-.434	.667
8.2 Issues of Site teams assembly	Equal variances assumed	.390	.535	.970	.336
	Equal variances not assumed			.967	.339
8.3 Site teams are often incomplete	Equal variances assumed	.010	.920	-.853	.397
	Equal variances not assumed			-.812	.422
8.4 Site management teams are often inexperienced	Equal variances assumed	2.134	.150	.791	.432
	Equal variances not assumed			.741	.464
8.5 Subcontract procurement issues are common	Equal variances assumed	14.380	.000	.100	.921
	Equal variances not assumed			.087	.932

8.6 Subcontractors often lack sufficient site management	Equal variances assumed	4.526	.038	.867	.390
	Equal variances not assumed			.955	.344
8.7 Generally subcontractors work unproductively	Equal variances assumed	3.811	.056	1.425	.160
	Equal variances not assumed			1.637	.107
8.8 Lack of subcontractors supervision impacts on quality	Equal variances assumed	.011	.918	3.383	.001
	Equal variances not assumed			3.449	.001
8.9 Cash flow problems of subcontractors causes the delays	Equal variances assumed	8.989	.004	-.872	.387
	Equal variances not assumed			-.763	.452
9.1 Design information is often late	Equal variances assumed	1.731	.194	2.989	.004
	Equal variances not assumed			2.971	.005
9.2 Design information is generally incomplete	Equal variances assumed	1.480	.229	-.727	.470
	Equal variances not assumed			-.762	.450
9.3 Designers' lackadaisical attitude for design update	Equal variances assumed	.743	.393	2.807	.007
	Equal variances not assumed			2.591	.014
9.4 Designers can often be inexperienced	Equal variances assumed	2.229	.141	3.240	.002

	Equal variances not assumed			3.111	.004
9.5 Designers are often short on resources	Equal variances assumed	.002	.967	.792	.432
	Equal variances not assumed			.821	.416
9.6 Poor cooperation between design team often lead to delay in design work	Equal variances assumed	.619	.435	2.744	.008
	Equal variances not assumed			2.911	.005
9.7 Poor communications between designers and contractor often delay projects	Equal variances assumed	.006	.939	.705	.484
	Equal variances not assumed			.697	.490
10.1 Bankruptcy of subcontractors may cause the delay in project	Equal variances assumed	.266	.608	1.310	.196
	Equal variances not assumed			1.324	.192
10.2 Commercial disputes are likely to delay projects	Equal variances assumed	1.834	.181	-1.745	.087
	Equal variances not assumed			-1.641	.110
10.3 Delay in payments may cause delays in projects	Equal variances assumed	7.200	.010	-1.174	.246
	Equal variances not assumed			-1.387	.171
10.4 High interest rates may affect project's schedule completion	Equal variances assumed	3.638	.062	4.155	.000
	Equal variances not assumed			3.696	.001

10.5 Poor liquidity in the financial markets is likely to delay projects	Equal variances assumed	4.424	.040	-.187	.852
	Equal variances not assumed			-.193	.847
11.1 Unavailability of plant often leads to project delays	Equal variances assumed	.041	.841	2.002	.050
	Equal variances not assumed			2.018	.050
11.2 Break down is likely to delay a project	Equal variances assumed	.034	.855	-2.686	.010
	Equal variances not assumed			-2.661	.011
11.3 Delays are often caused by plant not being fit for purpose	Equal variances assumed	.011	.918	3.383	.001
	Equal variances not assumed			3.449	.001
12.1 Inadequate labour may affect the project delays	Equal variances assumed	8.989	.004	-.872	.387
	Equal variances not assumed			-.763	.452
12.2 Poor labour output is likely to cause a delay in a project	Equal variances assumed	1.731	.194	2.989	.004
	Equal variances not assumed			2.971	.005
12.3 Industrial action often delays projects	Equal variances assumed	1.480	.229	-.727	.470
	Equal variances not assumed			-.762	.450
13.1 Raw Material procurement problems may cause delay	Equal variances assumed	.743	.393	2.807	.007

projects	Equal variances not assumed			2.591	.014
13.2 Poor quality of materials often cause delays due to rework, etc.	Equal variances assumed	2.229	.141	3.240	.002
	Equal variances not assumed			3.111	.004
13.3 Material delivery problems very often delay projects	Equal variances assumed	.002	.967	.792	.432
	Equal variances not assumed			.821	.416
14.1 Adverse weather may cause project delay	Equal variances assumed	.619	.435	2.744	.008
	Equal variances not assumed			2.911	.005
14.2 Unforeseen ground conditions may cause delay in project	Equal variances assumed	.006	.939	.705	.484
	Equal variances not assumed			.697	.490
14.3 Theft and vandalism impact on the ability to complete the project on time	Equal variances assumed	.266	.608	1.310	.196
	Equal variances not assumed			1.324	.192
14.4 Utilities (water, gas, electricity, etc.) may cause delay in project	Equal variances assumed	.100	.753	2.386	.021
	Equal variances not assumed			2.269	.029

From the above table 4.4, it can be concluded,

Client delays:

For the variables-"Delays are often caused by client changes", "Clients are generally slow in making decisions" and "Clients frequently have cash flow problem", it was found ($P<0.05$) that

there exist a perceived difference among academicians/ researchers vis-à-vis practitioners in the infrastructure projects.

Contractor delays

For the variable-"Lack of subcontractors supervision impacts on quality", it was found ($P<0.05$) that there exist a perceived difference among academicians/ researchers vis-à-vis practitioners in the infrastructure projects.

Designer delays:

For the variables-"Design information is often late", "Designers' lackadaisical attitude for design update", "Designers can often be inexperienced", and "Poor cooperation between design team often lead to delay in design work", it was found ($P<0.05$) that there exist a perceived difference among academicians/ researchers vis-à-vis practitioners in the infrastructure projects.

Financial delays:

For the variable-" High interest rates may affect project's schedule completion", it was found ($P<0.05$) that there exist a perceived difference among academicians/ researchers vis-à-vis practitioners in the infrastructure projects.

Plant delays:

For the variables-" Break down is likely to delay a project" and "Delays are often caused by plant not being fit for purpose", it was found ($P<0.05$) that there exist a perceived difference among academicians/ researchers vis-à-vis practitioners in the infrastructure projects.

Labour delays:

For the variable-" Poor labour output is likely to cause a delay in a project", it was found ($P<0.05$) that there exist a perceived difference among academicians/ researchers vis-à-vis practitioners in the infrastructure projects.

Material delays:

For the variables-"Raw Material procurement problems may cause delay projects" and "Poor quality of materials often cause delays due to rework, etc.", it was found ($P<0.05$) that there exist a perceived difference among academicians/ researchers vis-à-vis practitioners in the infrastructure projects.

Other delays:

For the variables-"Adverse weather may cause project delay" and "Utilities (water, gas, electricity, etc.) may cause delay in project", it was found ($P<0.05$) that there exist a perceived difference among academicians/ researchers vis-à-vis practitioners in the infrastructure projects.

Table 4.5 (Ranking of the Causes of Delays on the basis of RII Methodology)

Causes of delay	RII	Ranking
7.1 Delays are often caused by client changes	0.7	11
7.2 2 Clients are generally slow in making decisions	0.65	15
7.3 Clients are often inexperienced	0.53	19
7.4 Programme periods are often too short	0.61	17
7.5 Clients frequently have cash flow problem	0.76	7
7.6 Incomplete information between client and designer	0.66	14
8.1 lacks of experience in contractor	0.71	10
8.2 Issues of Site teams assembly	0.75	8
8.3 Site teams are often incomplete	0.75	8
8.4 Site management teams are often inexperienced	0.68	13
8.5 Subcontract procurement issues are common	0.7	11
8.6 Subcontractors often lack sufficient site management	0.65	15
8.7 Generally subcontractors work unproductively	0.71	10
8.8 Lack of subcontractors supervision impacts on quality	0.77	6
8.9 Cash flow problems of subcontractors causes the delays	0.79	4
9.1 Design information is often late	0.75	8
9.2 Design information is generally incomplete	0.62	16
9.3 Designers' lackadaisical attitude for design update	0.70	11
9.4 Designers can often be inexperienced	0.70	11
9.5 Designers are often short on resources	0.66	14
9.6 Poor cooperation between design team often leads to delay in	0.69	12

design work		
9.7 Poor communications between designers and contractor often delay projects	0.77	6
10.1 Bankruptcy of subcontractors may cause the delay in project	0.74	9
10.2 Commercial disputes are likely to delay projects	0.76	7
10.3 Delay in payments may cause delays in projects	0.75	8
10.4 High interest rates may affect project's schedule completion	0.83	1
10.5 Poor liquidity in the financial markets is likely to delay projects	0.82	2
11.1 Unavailability of plant often leads to project delays	0.70	11
11.2 Break down is likely to delay a project	0.60	18
11.3 Delays are often caused by plant not being fit for purpose	0.77	6
12.1 Inadequate labour may affect the project delays	0.80	3
12.2 Poor labour output is likely to cause a delay in a project	0.76	7
12.3 Industrial action often delays projects	0.66	14
13.1 Raw Material procurement problems may cause delay projects	0.70	11
13.2 Poor quality of materials often causes delays due to rework, etc.	0.70	11
13.3 Material delivery problems very often delay projects	0.66	14
14.1 Adverse weather may cause project delay	0.69	12
14.2 Unforeseen ground conditions may cause delay in project	0.77	6
14.3 Theft and vandalism impact on the ability to complete the project on time	0.74	9
14.4 Utilities (water, gas, electricity, etc.) may cause delay in project	0.78	5

According to above table 4.5 using relative importance index, it can be observed that the first five delay causes which are significantly important are, namely, high interest rates, poor liquidity in financial markets, Poor labour output, Cash flow problems of sub-contractors and problems of utilities.

Group wise RII (Relative Importance Index)

Client delays: In this category the most important factors responsible for delays comes out as cash flow problem of client.

Contractor delays: In this category, the problem of cash flows was identified as the most importance factor responsible for delays.

Designer delays: Poor communications between designers and contractor often delay projects was identified as the most important factor responsible for the delays in this category.

Financial delays: High interest rates factor was found as the most important factor of delay causes.

Plant delays: Delays caused by plant not being fit for purpose was the important factor identified in this category.

Labour delays: In this category of delays, inadequate labour availability was found as the most important cause of delay.

Material delays: Raw Material procurement and Poor quality related problems were identified as important causes of delays.

Other delays: Utilities was found as the most important cause of delay in this category.

5. CONCLUSIONS AND RECOMMENDATIONS

The present study "Causes of Delay in Infrastructure Projects: An Empirical Study in Tri-City of Chandigrah, Mohali And Panchkula" is an attempt to identify the causes of delays in infrastructure projects. It was found that first five delay causes which are significantly important are, namely, high interest rates, poor liquidity in financial markets, Poor labour output, Cash flow problems of sub-contractors and issues of utilities. The results of T-test showed that there was out of 40 factors, there exists a perceived difference among both categories that is academicians/researchers and practitioners for 17 factors.

5. 1 RECOMMENDATIONS

The present study "Causes of Delay in Infrastructure Projects: An Empirical Study in Tri-City of Chandigrah, Mohali And Panchkula" is an attempt to identify the causes of delays in infrastructure projects. The following are the recommendations as follows:

1. To control causes of delays in infrastructure, appropriate mix of different type of sources of finances should plan of before the start of the project. Adequate arrangements related to same must be made so as to reach the financial closure appropriately which in turn will take care of finances of the project. As the infrastructure projects are capital intensive and are long getstaive

in nature, hence project financing must be thought for the same. Further, the mezzanine financing, foreign sources of capital like masala bond etc. must be tapped to make a sound arrangement of the finances.

2. Poor labour output can be handled by incentivizing the labour using monetary and non-monetary benefits. In case, if possible, ESOPs (Employee Stock Options) can be given to labour so that they will assume as the beneficiary/owner of the project. Moreover, they should be incentivize through performance related pay mechanism so as to make them feel motivated.

3. Observing the importance of infrastructure development, the Government/ Statutory Government must take care of utilities like water, electricity, road etc.

5.3 LIMITATIONS AND FUTURE RESEARCH ISSUES

The present studies possess limitations as follows:

1. Sample size considered is small and hence results of the study cannot be generalized. For the better results, there bigger size of the sample could have been taken. Moreover, the cross-comparison of the causes of delays could be explored so as to make meaningful generalizations.

2. Only few sub sectors like Power Plants, Airports, and Construction Projects are parts of the study has lead to paucity of the data. For the better results, the other sub-sector can be included for a better view of the causes of delays.

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