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Analysing The Time And Cost Overruns In The Central Sector Projects

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Abstract

Infrastructure development is the backbone of a country's economic growth. But infrastructure projects nowadays mostly suffer from overruns in respect of time and cost. They have become a global obstacle hampering the pace of infrastructure development. Presently, infrastructure projects globally are suffering from cost and time overruns irrespective of private or government-owned projects. In India, the Central Sector Projects are infrastructure projects planned, implemented and monitored by the Union Government which plays a pivotal role in India's infrastructure development. However, due to economic malaises like cost and time overruns, a massive financial burden has been put on the government even exaggerating some sectors. Mostly, these projects commence with their date of commissioning but either face delays or cost overrun or with both. This paper is an attempt to analyse the trends of cost and time overruns in the Central Sector Projects for a specified period (2015-2021). The present study has adopted a secondary method of data collection and hence referred to government reports. Some sectors witnessed a maximum number of projects with cost and time overruns. An analysis is done through Kendall's Rank Correlation Coefficient (T) between cost and time overruns of varied sectors. The paper concludes by providing some implications for future research and policy formulation for the government and project participants.

***Keywords*: Project management, Project monitoring, Central Sector Projects, Cost overrun, Time overrun**

Introduction

Every country's infrastructure development is both its foundation and a key sign of economic expansion. Nowadays, whether a nation is developed or developing, infrastructure is essential. Because infrastructure is so essential, demand for it has grown across all sectors of the economy as a result of global population

growth. A developing nation such as India is also confronted with a strong demand versus supply imbalance in all areas of infrastructure.

In India, the two main problems with infrastructure projects are cost overruns and delays. These significant problems cause enormous losses throughout the whole project implementation process, undermining the advantages gained from the infrastructure facilities. As was previously said, it is now a permanent problem at every stage of project execution. Similar to other projects, the Central Sector Projects also have ongoing cost and time overruns. To uncover fundamental problems, research has to be done, mostly based on a rigorous analysis of the time and cost overruns in the Central Sector Projects. However, a formal introduction regarding the Central Sector Projects is necessary before delving into the proposed study.

"Central Sector Projects" are those that are overseen, managed, and funded by the Central Government itself. These initiatives for national development and economic growth are implemented and monitored effectively by the Union Government through its ministries and departments. These initiatives are carried out in a number of Indian states and in a variety of industries. To monitor the progress of Central Sector Project implementation, the Indian government has set up a monitoring framework. The main goals of this method are to decrease time and cost overruns and to increase responsibility, authenticity, and openness.

IPMD (Infrastructure and Project Monitoring Division) is the major monitoring organisation and project management division for the Government of India and is a part of the Ministry of Statistics and Programme Implementation. It accomplishes three things by monitoring the performance of the top 11 infrastructure sectors as well as the development of Central Government projects totalling more than Rs. 150 crores across 16 different infrastructure sectors. The IPMD releases a number of papers that include analytical data. The IPMD's duties can be summed up as: keeping an eye on how projects are being implemented and how well the infrastructure is performing; starting systemic changes and better project management techniques, and facilitating discussions about issues with the appropriate authorities in the case of specific projects. The progress of Central Sector Projects costing more than Rs. 150 crores is monitored using the online computerised monitoring system (OCMS). In every three months, the Quarterly Project Implementation Status Report which contains information on all of the projects on the monitor released by IPMD, the Monthly Flash Report on Central Sector Projects which accounts for the Central Sector Projects (costing 150 crore and above) cost and time overruns releases every month. (*Infrastructure and Project Monitoring Division (IPMD) | MOSPI*, n.d.)

Keeping in view the sensitivity of cost and time overruns issue at the project implementation stage, there was a need to review the past studies to bring out the research gaps and justification of proposed study. Below is the complete version providing a comprehensive review of literature related to cost & time overruns, its causes and measures to minimise these overruns.

Review of Literature

1. Reviews related to Cost overrun & Time overrun

India's infrastructure industry is now dealing with a number of difficulties. The constant rise in the number of stalled projects with significant time and cost overruns is a major cause for concern. The time interval between the actual and the previously anticipated (i.e., planned) completion dates is what we refer to as the "time overrun." Similarly, we define "cost overrun" as the variation between the projects' actual cost and their initially anticipated (i.e., projected) cost. Cost overruns and delays continue to be excessively common. They are causing the economy to bear heavy but largely avoidable costs. (Sinha & Wayal, 2013)

Both the employer and the contractor typically care about how quickly and inexpensively a project will be completed. One of the ongoing issues in the infrastructure sector is delays, which have a negative impact on the timeliness, cost, and quality of projects. Many nations, including India, Jordan, Nigeria, and Saudi Arabia, experience project time overruns and cost overruns, and research on the reasons of these issues is also performed. The delay may happen simultaneously with other delays, and they all have its affect when the project will be completed. The phase of the project is delayed, and there are various gaps between the actual rate of site work progress and the planned work. (Salunkhe & Patil, 2014)

The cost overrun is one of today's most crucial issue, necessitating extensive study and investigation to resolve or lessen the delay and less variance in budget for upcoming projects. An unexpected cost that exceeds the budgeted amount owing to a miscalculation of the actual cost budgeting for construction projects

is referred to as a 'cost overrun'. The majority of infrastructure projects in India are impacted by cost overruns and schedule delays. Among them, mostly public infrastructure projects in India experience delays and cost overruns. (Kage et al., 2018)

This study's goal is to suggest a theoretical framework for cost overruns in infrastructure projects and a matching management strategy. The performance of ongoing and finished megaprojects in 2016 is examined in this paper, along with the frequency and size of significant cost overruns on infrastructure projects. The data was taken from Infrastructure and Project Monitoring Division of Ministry of Statistics and Programme Implementation. Slow decision-making, poor schedule management, rising material and machine prices, poor contract management, poor design, difficulties with land acquisition and incorrect estimation were found to be the main causes of cost overrun. (Srivastava & Patil, 2016)

2. Reviews related to Causes of Cost & Time Overruns

The main objective of the study is to identify the factors that contribute to time and cost overruns in infrastructure projects and provide suitable solutions. Poor planning, execution, and management commonly result in time and cost overruns on these projects in India. Because most of the causes are well known and treatable with the appropriate setup. (Mulla & Waghmare, 2015)

This research was done to determine what factors contribute to cost overruns in infrastructure projects. As per the study, the main causes of cost overrun are slow decision-making, poor schedule management, rising material and machine prices, poor contract management, poor design, delay in providing design, rework due to incorrect work, issues with land acquisition, incorrect estimation method, and a long time between design and time of bidding. (Subramani et al., 2014)

This paper's goal is to examine all the significant variables contributing to cost overruns and identify the crucial factors of cause and effect of delay in construction projects. Six factors, including time overruns, cost overruns, disputes, arbitration, complete abandonment, and litigation, can cause delays in building projects. (Sha et al., 2017)

The purpose of this study is to identify the important factors that contribute to infrastructure project delays, as well as to reduce these delays. Construction projects can be delayed for a variety of reasons. The elements are dependent on innovation and how it is managed, as well as on those in the physical, social, and economic environments. (Khattri et al., 2016)

In order to determine the most important causes of cost overruns in construction projects and the techniques used to identify them, a literature review was carried out for this research. Time and cost overruns in a project lifecycle are shown to be mostly caused by a lack of qualified project managers, frequent design modifications and poor procurement planning are the main causes of cost overruns, which can be reduced by providing project managers with the right training. Because of this, cost uncertainty analysis is a crucial component of cost estimation that aids decision makers in understanding the nature of risks for a given project or programme as well as their possible financing exposure. (Jose & Xavier, 2018)

3. Reviews related to Minimisation of Time and Cost overruns

This paper's main goal is to pinpoint the main causes of cost overruns in infrastructure projects in India as well as the crucial success criteria that aid in preventing cost overruns. Effective vital success aspects include early contractor involvement, good client-contractor communication, skilled architects and contractors, suitable planning at the outset of the project, and early contractor involvement. The best techniques for reducing cost overruns include effective planning, adequate site management and project supervision, optimal planning and project arrangement, appropriate construction methods, regular meetings on project development, and selecting qualified subcontractors and suppliers. (Shibani & Arumugam, 2015)

The main goal is to pinpoint the main causes of cost overruns in construction projects in India as well as the crucial success criteria that aid in preventing them. The best techniques for reducing cost overruns include effective planning, proper site management and project supervision, suitable planning and project arrangement, proper construction procedures, regular meetings on the project's progress, and selecting competent subcontractors and suppliers. (Shete & Kothawade, 2016)

The paper suggested various measures to minimise cost and time overruns in infrastructure projects. For example, Consultants should carefully handle the design changes during the execution of project, any design errors by the contractors should be rectified instantly, all working drawings must be carefully produced, including all dimensions and markings to scale, contractors should pay close attention to the assignment's requirements during the pre-contract and bidding phases in order to select projects where they may offer a competitive edge, Contractors should make sure they have sufficient cash flow to complete the project, to prevent needless arguments and litigation, it is imperative that all change order requests be assessed for their influence on the quality of the work anticipated, scope, and cost, as well as any potential claims and work disruption. (Shinde & Minde, 2018)

The primary goal of this study is to identify the factors that cause cost overruns and delays using literature and a questionnaire that includes 30 cost overrun-related factors and 35 delay-related factors. According to this study, application of the Pareto analysis (80-20 Rule), 80% of cost overruns and delay issues can be reduced or controlled by using long-term factors. Efficient project planning, proper monitoring of project execution, availability of resources at workplace, time management practices, minimisation of loss, efficient financial and technical management are some ways to minimise cost and time overruns of the projects. (Akhter & Reza, 2021)

After reviewing the past studies with varied dimensions, some research gaps were identified that became justification of proposed study. Some of the research gaps and justifications are mentioned below.

Research Gaps and Justification for Study

- Some past studies showcased the trends of projects with cost and time overruns but it is confined to the construction industry. This study showcases the trends of projects with cost and time overruns belonging to different sectors in the Central Sector Projects.
- The past studies gave no emphasis on implications of cost and time overruns on the projects. The present study tries to ascertain the sector-wise implications of cost and time overruns in the Central Sector Projects with the help of correlational analysis.
- Most of the past studies have considered primary method of data collection such as questionnaires or interviews. The present study is based on secondary method of data collection as data related to cost and time overruns is retrieved from annual reports published by the government.
- In rare studies, secondary data has been collected by the researcher but it is confined to a specific sector, region or state. The present study considers the secondary data across different sectors in the Central Sector Projects irrespective of region or state.

Under this section, various national and international journals were taken into consideration to extensively study the extent, trends, causes of and remedial measures against cost and time overruns. But none of them crafted out the broad objectives that could be able to cover sector wise issues pertaining to cost and time overruns. They were either sector or region specific and hence a comprehensive study proved to be missing that would be able to cover economic as well as social infrastructure; and other energy sectors and should be irrespective of any specific region.

Objectives of Research

After critical examination of existing literatures pertaining to the extent, causes of and remedial measures for cost and time overruns in the construction sector; identification of research gaps and proven justification for the study, the following broad research objectives with respect to the Central Sector Projects were framed:

1. To analyse the trends of time and cost overruns in the Central Sector Projects.
2. To ascertain the sector-wise degree of relationship between time and cost overruns.

Problem identification is the initial step in research process, which got accomplished here through literature review. After getting acquainted with the problem, broad objectives were framed possessing both quantitative as well as qualitative elements. The next step was to formulate a research design in the light of aforementioned objectives.

Research Methodology

As far as research methodology corresponding to the framed objectives is concerned, the concurrent mixed methods research is adopted as both types of data i.e., quantitative & qualitative were gathered and separately used to achieve the aforesaid objectives. However, data collection through secondary source was done within a single phase. The present study is exploratory in nature to gain insights and familiarity about the emerging issues in project implementation and management especially, in the Central Sector Projects. These projects are planned, implemented and monitored by the government. In view of this, the research strategy adopted in this paper was archival and document research. Therefore, in this sense, government records were used in the form of annual reports. Below is the detailed information given about the data need, data source, data limitations and analytical tools used for this study to achieve desired objectives:

a. Data need- In order to achieve the aforementioned objectives, secondary method of data collection was adopted in the present study. This study is related to the various issues involved in the implementation of Central Sector Projects and therefore government's compiled data in the form of annual reports were studied and analysed in compliance with the broad objectives. Being a government compiled data, it ensures reliability, validity, comparability, permanence, time saving and economical.
b. Data source- With respect to data source, a secondary compiled data with respect to the extent, causes and remedial measures for cost and time overruns was collected through the annual reports published by MOSPI (Ministry of Statistics and Programme Implementation). The values with respect to cost and time overruns for a period six years i.e., from 2015-16 to 2021-22 were taken into consideration.
c. Limitations of the data- The study is purely based on secondary data and hence no scope for primary data. The collected compiled secondary data came from only one source i.e., annual reports of MOSPI (Ministry of Statistics and Programme Implementation). Since it is a government data so there is no control over the quality of data. Here, the time frame of secondary data in consideration is six years and not more than that.
d. Analytical tools- First of all, a secondary data in consideration was critically checked and verified from the original source for any error. Afterwards, data matrices containing variables were prepared for enabling analysis interface to accept data in consideration. In order to achieve the aforementioned objective of quantitative nature, sector-wise Kendall's Rank Correlation (T) analysis between cost and time overruns was applied with the help of data analysis interface 'R' Programming. After mentioning a brief research methodology, the next step in this paper is data analysis.

Data Analysis

In this section, the sector wise trends of cost and time overruns during the period ranging from 2015 to 2021; and relationship between them are represented in the form of tables and graphs. From Table 1.1 to 1.21, a comprehensive picture regarding the sector wise information which includes projects with time and cost overruns, average time overrun, cost overrun and Kendall's Rank Correlation Coefficient (T) values are provided.

Table 1.1

Atomic Energy					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	Kendall's Rank Correlation Coefficient (T)
2015	3	44.5	2	37.71	0.745356
2016	3	60	2	68.87	
2017	3	68	1	71.82	
2018	4	84.5	2	51.7	
2019	4	84.5	3	48.51	
2020	4	90.5	3	48.51	
2021	4	90.5	3	48.51	

Source: Annual Reports, Government of India

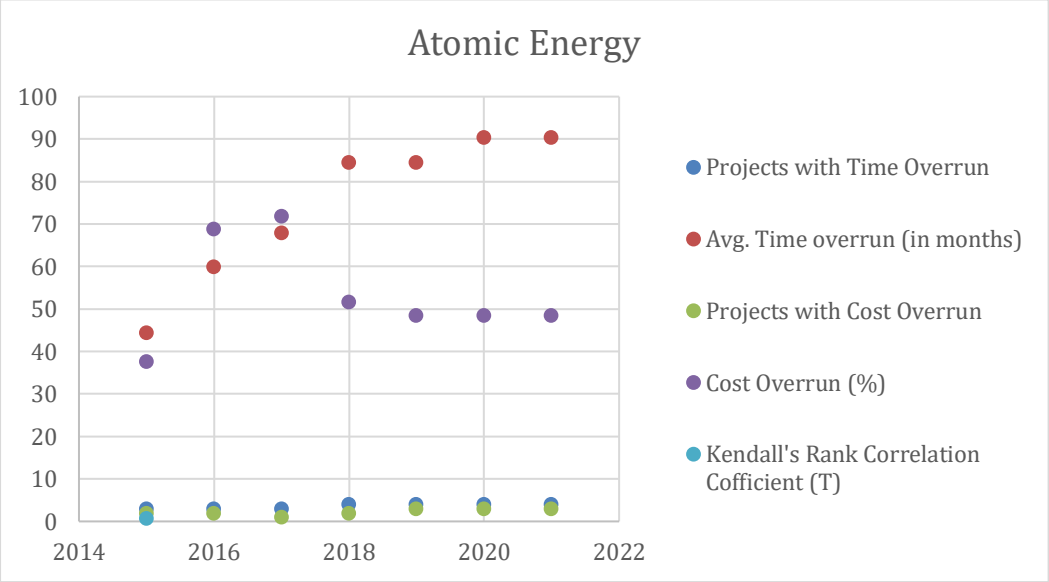


Table 1.2

Civil Aviation					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	Kendall's Rank Correlation Coefficient (T)
2015	1	80	1	12.18	0.9192547
2016	1	80	0	0	
2017	2	50.5	2	59.41	
2018	1	21	1	40.28	
2019	5	13.5	3	8.39	
2020	13	19	3	13.02	
2021	19	24	4	33.89	

Source: Annual Reports, Government of India

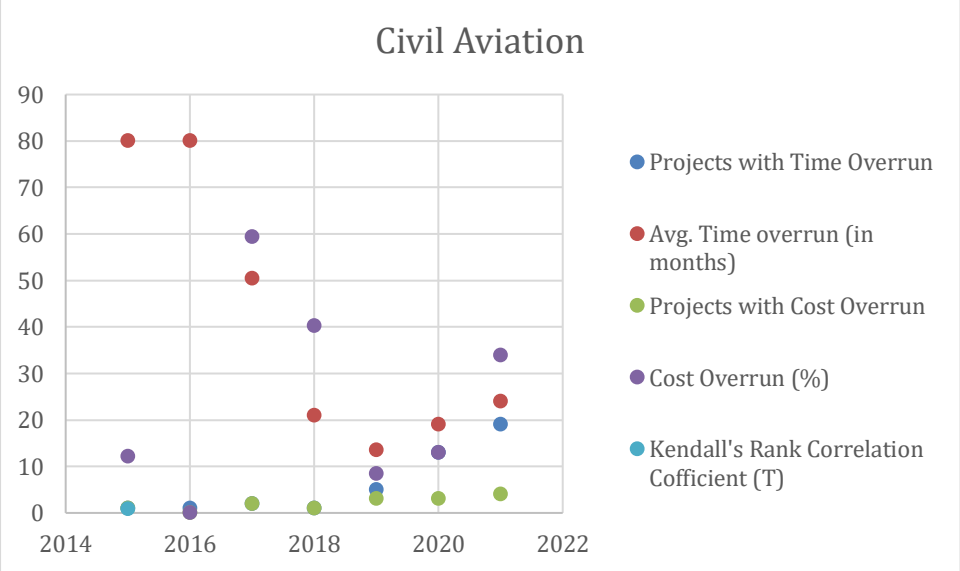


Table 1.3

Coal					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	Kendall's Rank Correlation Cofficient (T)
2015	44	56	3	141.15	0.3504383
2016	38	69	6	85.86	
2017	39	68	7	5.5	
2018	36	78	10	6.82	
2019	37	78	12	17.04	
2020	42	120	19	22.09	
2021	56	120	19	16.51	

Source: Annual Reports, Government of India

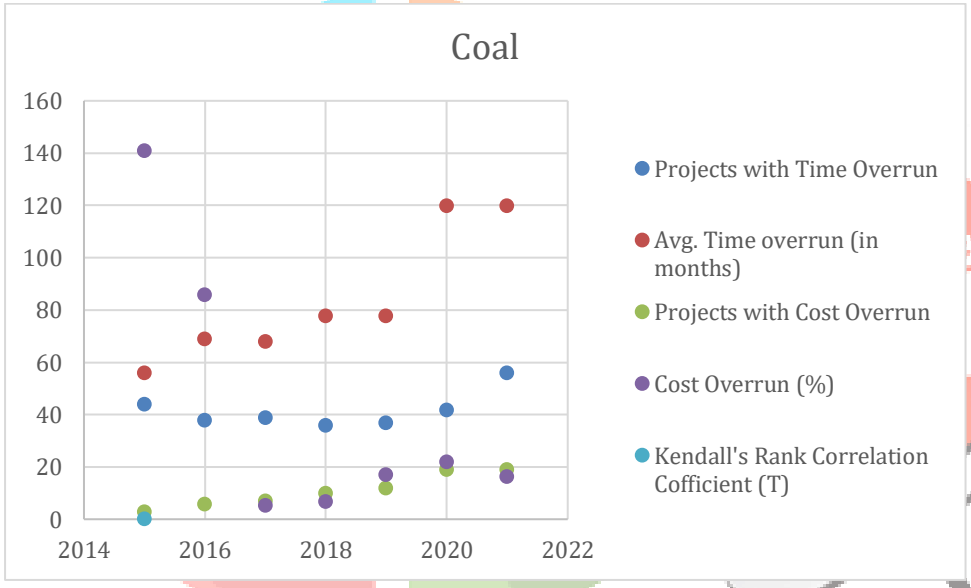


Table 1.4

Fertilisers					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	Kendall's Rank Correlation Coefficient (T)
2015	0	0	0	0	-0.2666667
2016	1	10	1	5.89	
2017	1	29	2	3.35	
2018	2	21.5	1	5.89	
2019	1	34	1	5.89	
2020	4	13.5	0	0	
2021	1	20	0	0	

Source: Annual Reports, Government of India

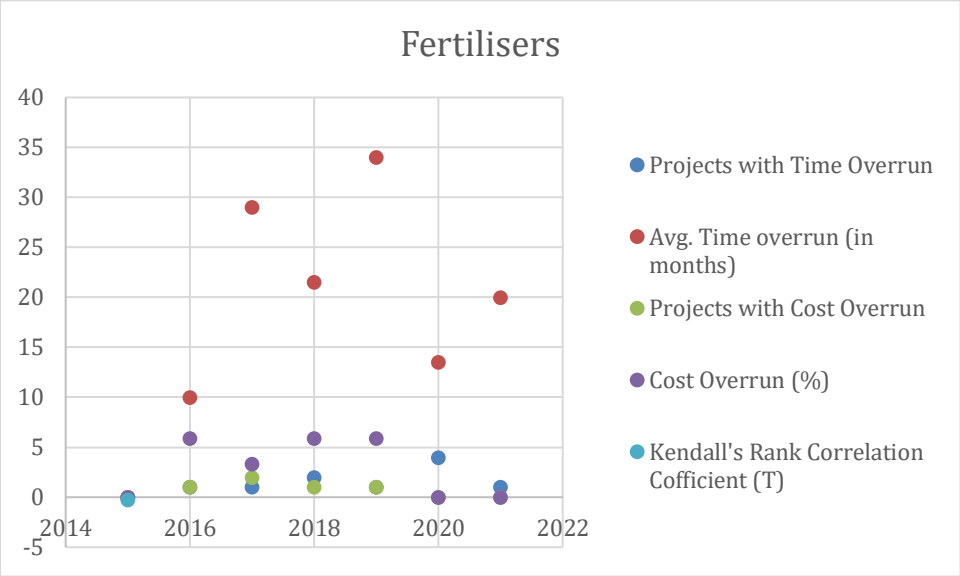


Table 1.5

Steel					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	Kendall's Rank Correlation Coefficient (T)
2015	10	20	1	42.39	0.2236068
2016	13	25.5	5	32.28	
2017	17	38.5	5	34.86	
2018	10	29	1	42.39	
2019	8	37	1	49.05	
2020	7	41	2	40.58	
2021	5	56	2	39.7	

Source: Annual Reports, Government of India

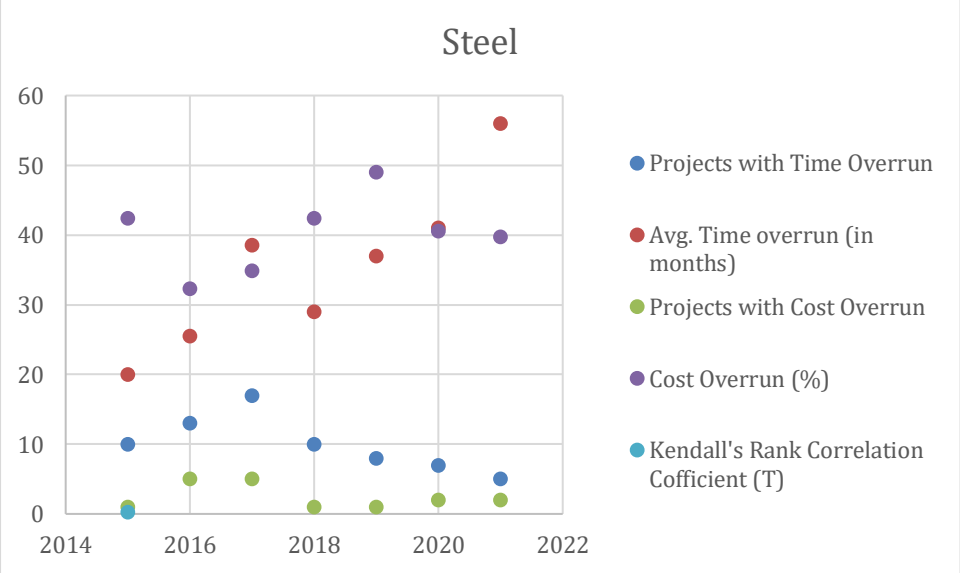


Table 1.6

Petroleum					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T

2015	36	36	18	18.7	0.650814
2016	38	36	14	22.8	
2017	35	47	17	26.21	
2018	33	41	17	38.04	
2019	52	55.5	27	23.15	
2020	70	56.5	29	30.42	
2021	86	55.5	29	36.78	

Source: Annual Reports, Government of India

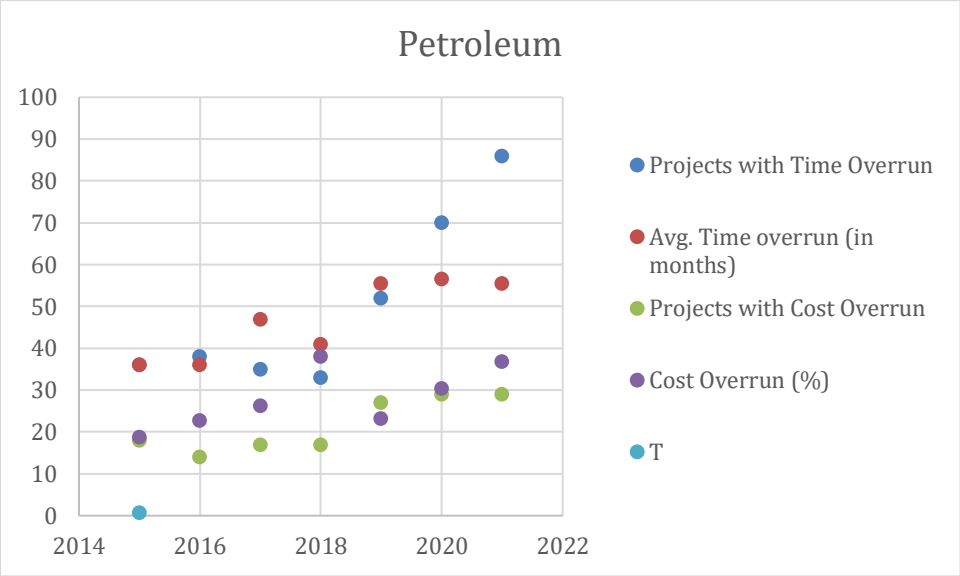


Table 1.7

Power					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	57	63.5	19	88.3	0.350438
2016	61	67.5	29	64.11	
2017	61	69.5	44	54.8	
2018	57	74	38	36.38	
2019	49	76	30	48.06	
2020	41	81	28	45.59	
2021	42	84	22	60.59	

Source: Annual Reports, Government of India

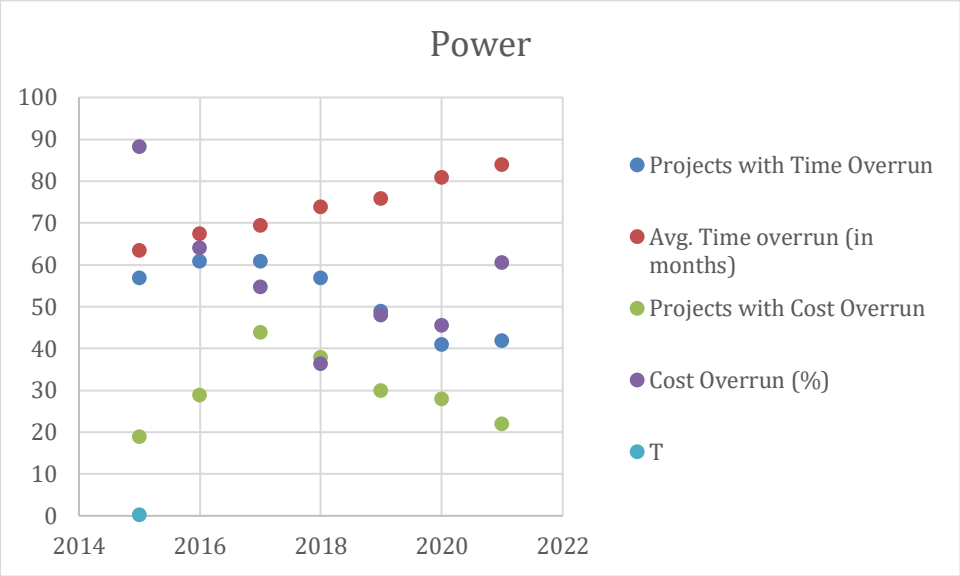


Table 1.8

Railways					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	29	132	160	154.84	0.238095
2016	41	136	185	148.87	
2017	36	136.5	213	133.14	
2018	99	162.5	207	129.66	
2019	146	162.5	187	120.11	
2020	159	163	209	108.93	
2021	141	163	202	105.49	

Source: Annual Reports, Government of India

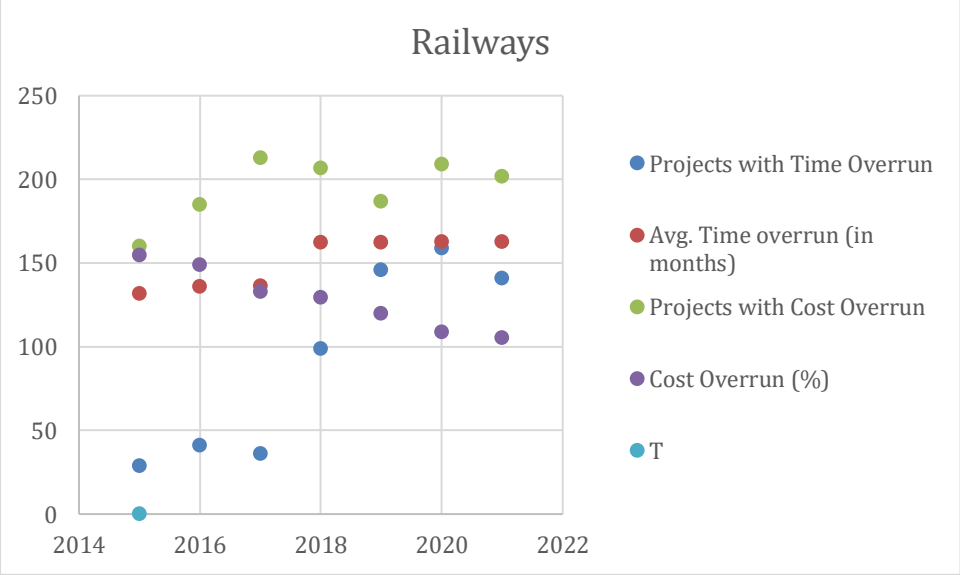


Table 1.9

Surface Transport					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	16	55.5	13	56.13	0.468213
2016	111	57.5	19	41.31	
2017	74	60.5	43	27.57	
2018	104	66	49	50.58	
2019	225	75	92	39.3	
2020	146	76.5	126	28.19	
2021	134	69.5	120	25.18	

Source: Annual Reports, Government of India

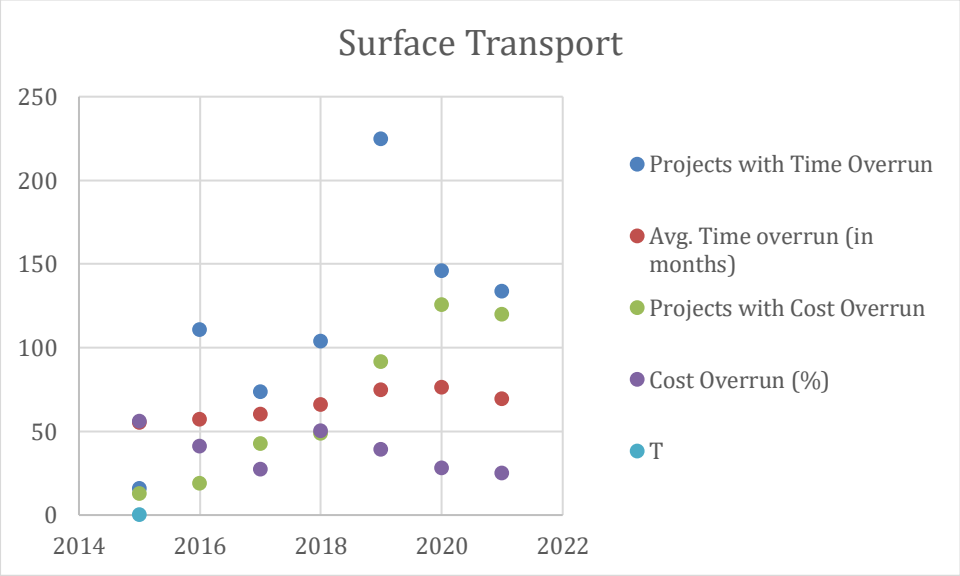


Table 1.10

Telecommunication					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	1	61	0	0	0.267261
2016	2	24	0	0	
2017	1	47	1	84.97	
2018	3	31	1	84.97	
2019	2	36	2	83.58	
2020	3	38	1	84.97	
2021	3	44.5	1	84.97	

Source: Annual Reports, Government of India

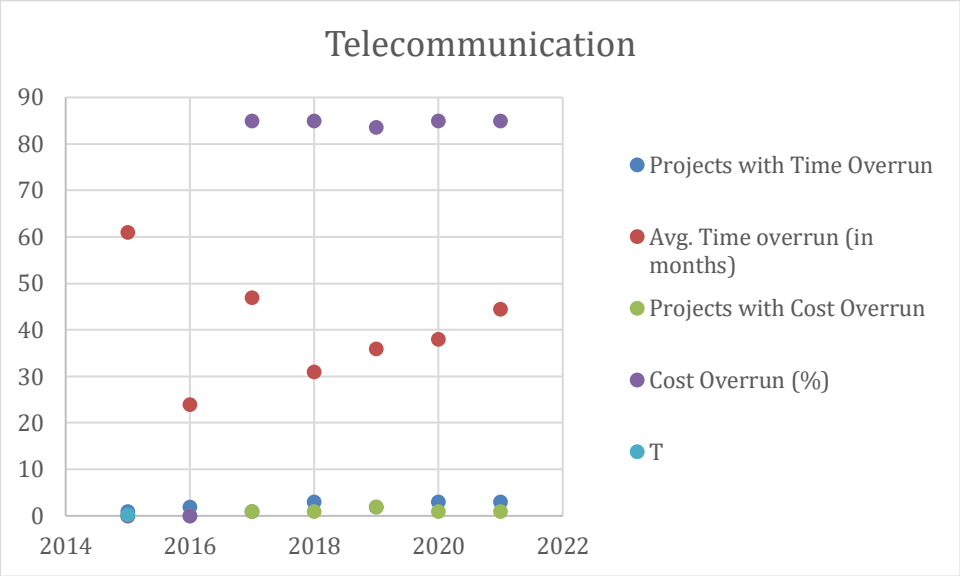


Table 1.11

Urban Development					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	12	22	1	81.53	0.619048
2016	16	34.5	3	83.96	
2017	20	37	6	55.28	
2018	21	39.5	11	25.07	
2019	24	45.5	14	22.82	
2020	10	31	5	23.24	
2021	14	42.5	7	23.46	

Source: Annual Reports, Government of India

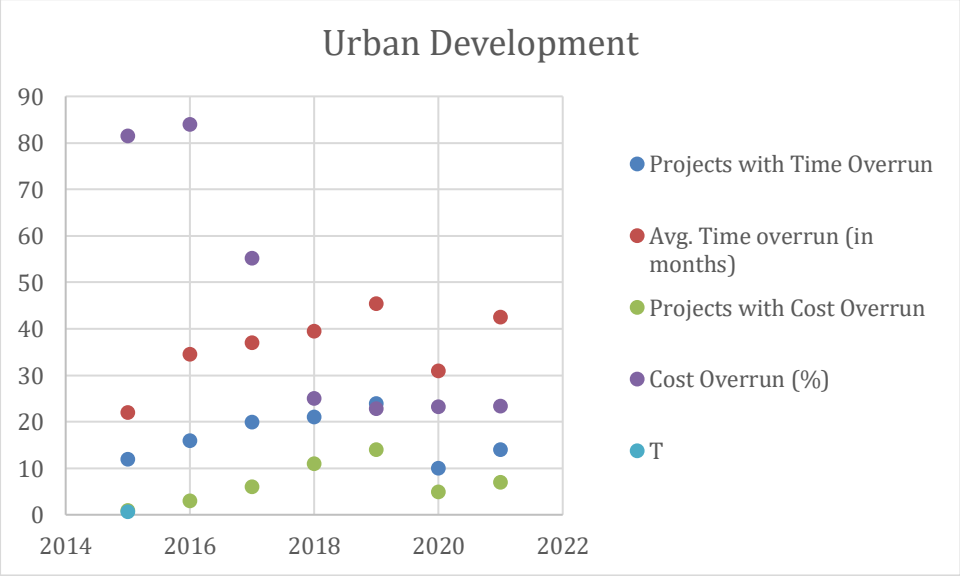


Table 1.12

Petrochemicals					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	1	44	1	82.49	0.645497
2016	0	0	1	82.49	
2017	0	0	0	0	
2018	0	0	0	0	
2019	0	0	0	0	
2020	0	0	0	0	
2021	0	0	0	0	

Source: Annual Reports, Government of India

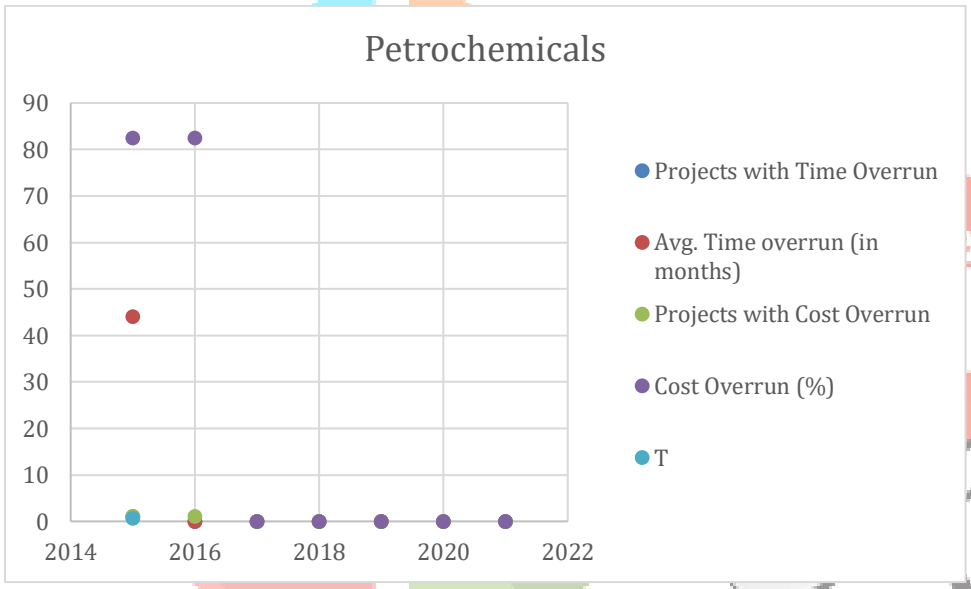


Table 1.13

Water Resources					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	0	0	0	0	0.866667
2016	0	0	0	0	
2017	0	0	0	0	
2018	0	0	0	0	
2019	1	15	1	447.22	
2020	17	36.5	2	437.26	
2021	8	14.5	8	374.82	

Source: Annual Reports, Government of India

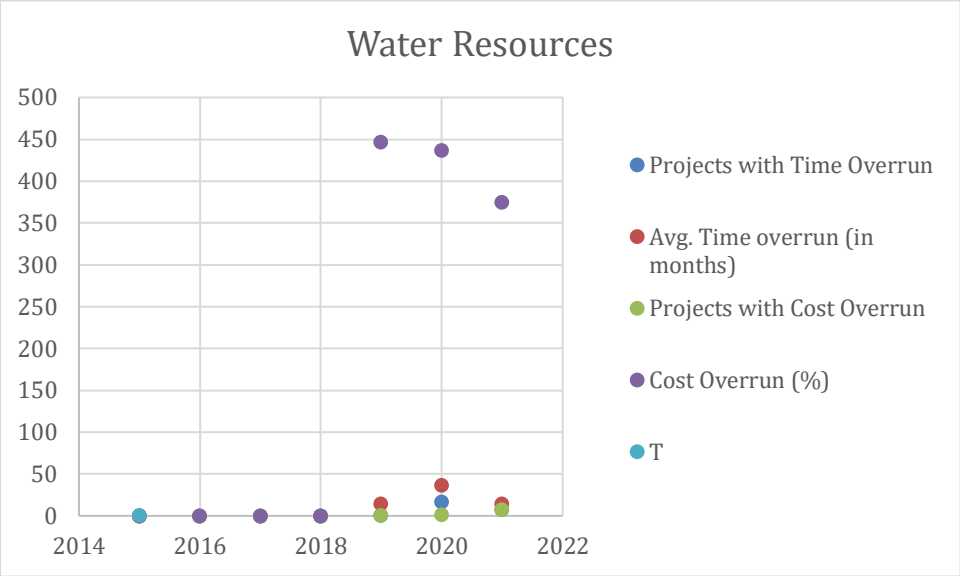


Table 1.14

Heavy Industry					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	1	75	1	122.78	0.091287
2016	1	75	1	122.78	
2017	1	75	1	122.78	
2018	0	0	1	122.78	
2019	0	0	0	0	
2020	1	15	0	0	
2021	0	0	1	116.96	

Source: Annual Reports, Government of India

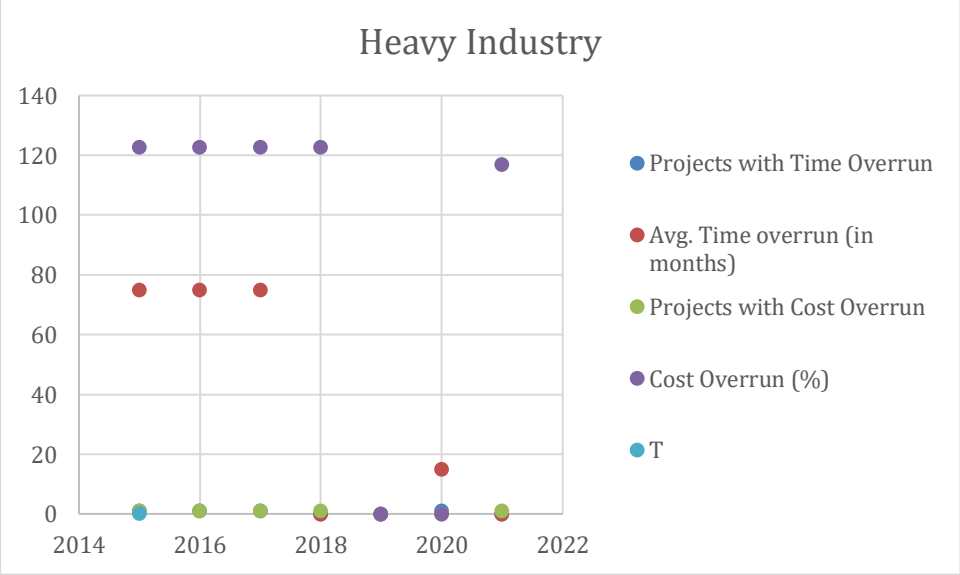


Table 1.15

Defence Production					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	0	0	0	0	-0.2582
2016	0	0	0	0	
2017	0	0	2	3.39	
2018	0	0	0	0	
2019	0	0	0	0	
2020	1	16	0	0	
2021	1	22	0	0	

Source: Annual Reports, Government of India

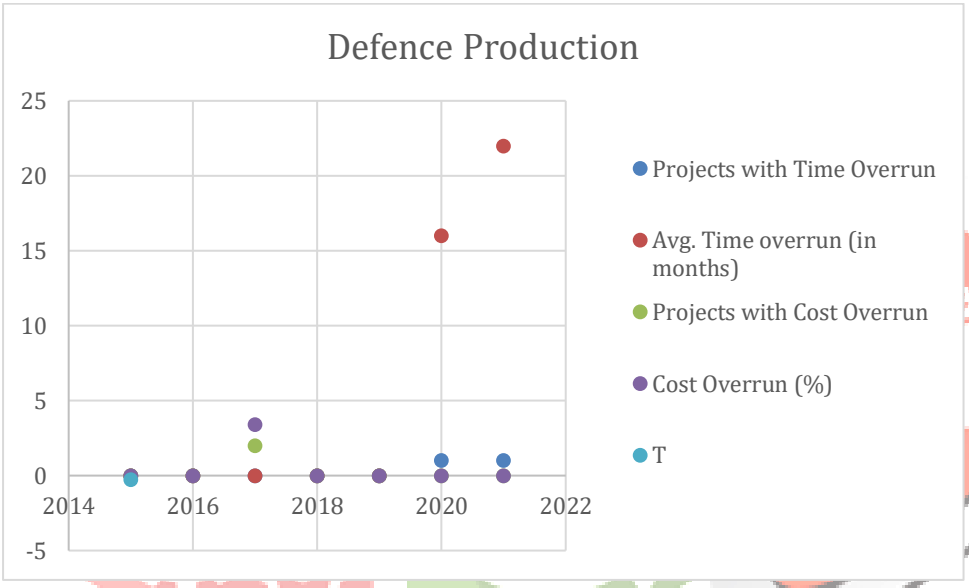


Table 1.16

Commerce & Industry					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	0	0	0	0	0.953463
2016	0	0	0	0	
2017	0	0	0	0	
2018	0	0	0	0	
2019	0	0	0	0	
2020	2	20.5	2	9.44	
2021	1	29	2	9.44	

Source: Annual Reports, Government of India

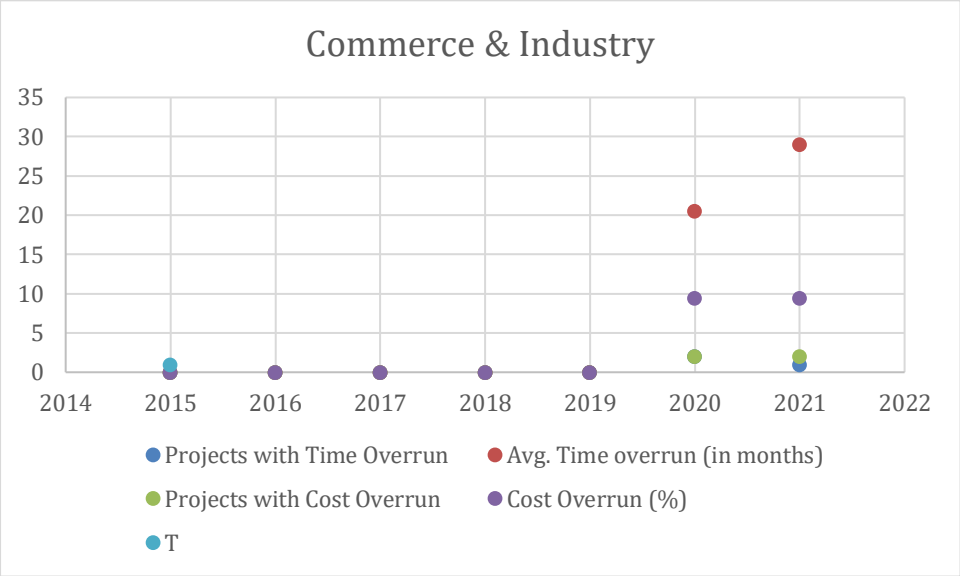


Table 1.17

Human Resource Development					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	0	0	0	0	0.953463
2016	0	0	0	0	
2017	0	0	0	0	
2018	0	0	0	0	
2019	0	0	0	0	
2020	14	39	5	11.47	
2021	14	43.5	4	10.14	

Source: Annual Reports, Government of India

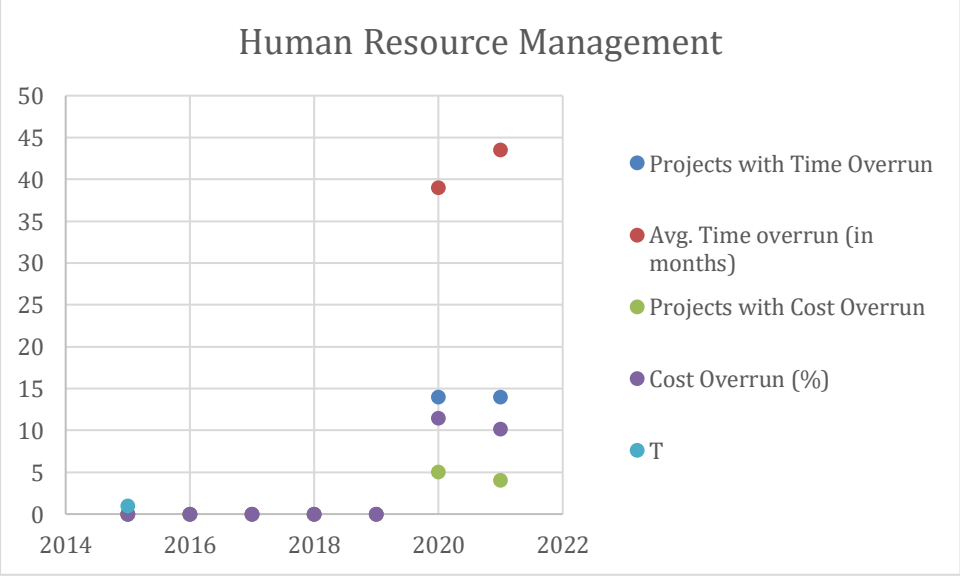


Table 1.18

Home Affairs					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	0	0	0	0	1
2016	0	0	0	0	
2017	0	0	0	0	
2018	0	0	0	0	
2019	0	0	0	0	
2020	2	27.5	2	57.67	
2021	3	23.5	3	52.36	

Source: Annual Reports, Government of India

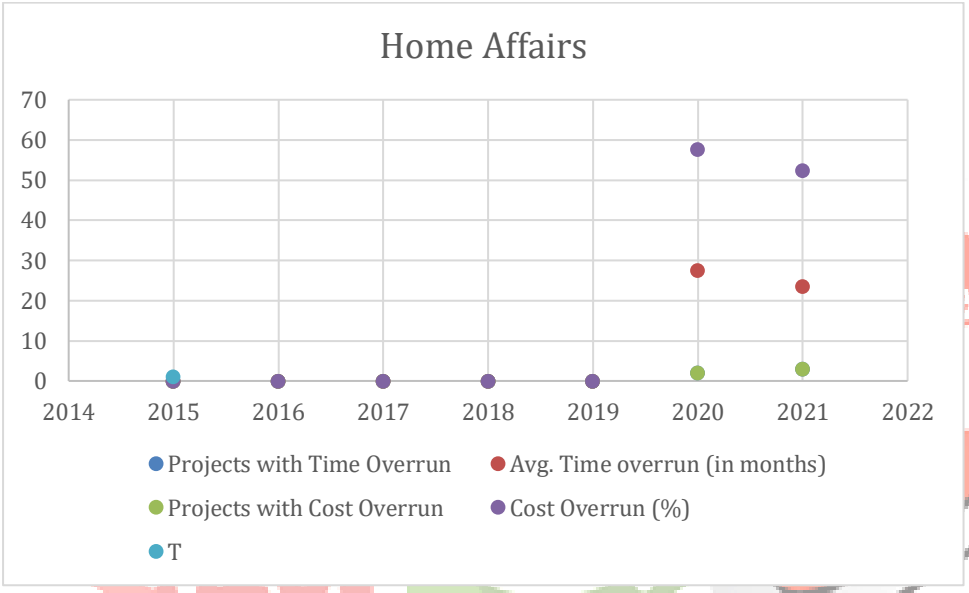


Table 1.19

Rural Development					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	0	0	0	0	1
2016	0	0	0	0	
2017	0	0	0	0	
2018	0	0	0	0	
2019	0	0	0	0	
2020	3	56.5	2	2.96	
2021	0	0	0	0	

Source: Annual Reports, Government of India

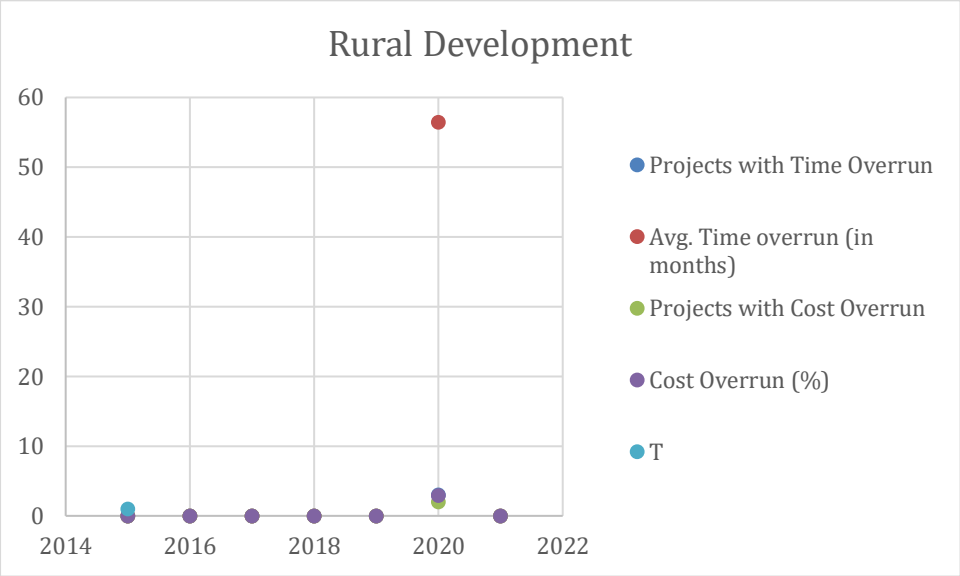


Table 1.20

Shipping and Ports					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	3	89	4	57.75	0.554589
2016	1	96	5	80.24	
2017	2	118.5	5	80.24	
2018	2	92	3	102.53	
2019	0	0	1	27.84	
2020	0	0	0	0	
2021	0	0	0	0	

Source: Annual Reports, Government of India

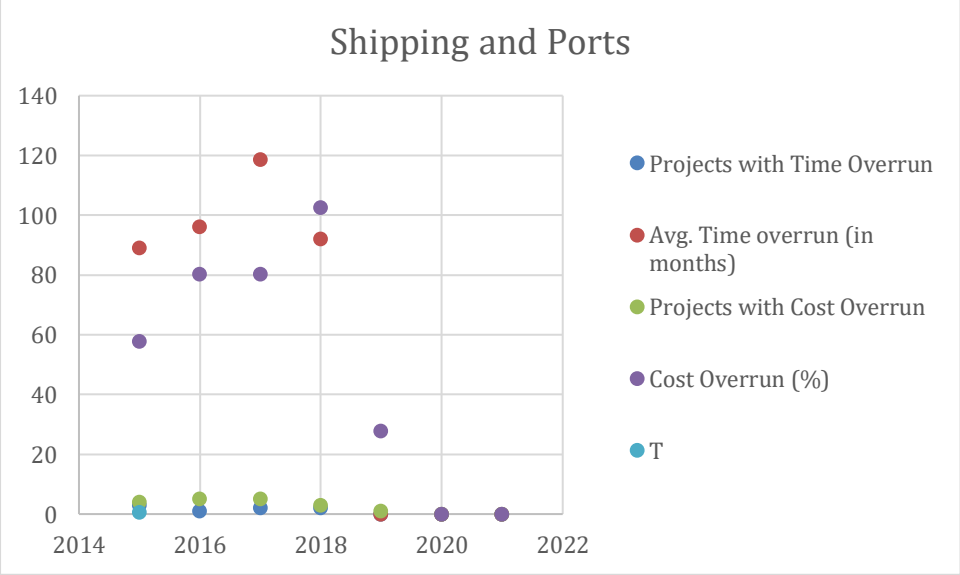
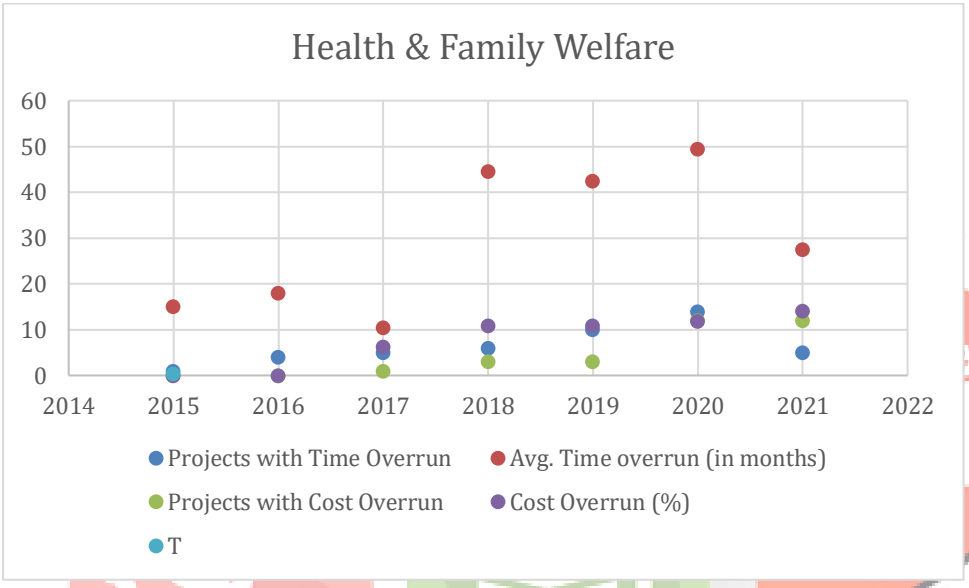


Table 1.21

Health & Family Welfare					
Years	Projects with Time Overrun	Avg. Time overrun (in months)	Projects with Cost Overrun	Cost Overrun (%)	T
2015	1	15	0	0	0.402567
2016	4	18	0	0	
2017	5	10.5	1	6.25	
2018	6	44.5	3	10.9	
2019	10	42.5	3	10.9	
2020	14	49.5	12	11.88	
2021	5	27.5	12	14.05	

Source: Annual Reports, Government of India



Data Interpretation

In this paper, from Table 1.1 to 1.21, 21 sectors were selected to analyse the trends of cost and time overruns for the period 2015 to 2021. As evident from tables, sectors like Coal, Steel, Petroleum, Power, Railways, Surface Transport and Urban Development have witnessed maximum number of projects with cost and time overruns.

Moreover, the degree of relationship between cost and time overruns of respective sectors was also analysed through Kendall's Rank Correlation Coefficient with the help of data analysis interface 'R' Programming.

Table 6.1 provides a brief summary of sector wise data analysis and interpretation with respect to the value of correlation and the degree of relationship exists between cost and time overruns of respective sectors.

Table 6.1 Summary of Data Analysis & Interpretation

S.No.	Sectors	Kendall's Rank Correlation Coefficient (T)	Degree of Relationship (between cost and time overruns)
1.	Atomic Energy	0.745356	Moderate positive relationship
2.	Civil Aviation	0.9192547	Strong Positive relationship

3.	Coal	0.3504383	Weak positive relationship
4.	Fertilisers	-0.266666	Weak negative relationship
5.	Steel	0.2236068	Weak positive relationship
6.	Petroleum	0.650814	Moderate positive relationship
7.	Power	0.3504383	Weak positive relationship
8.	Railways	0.2380952	Weak positive relationship
9.	Surface Transport	0.4682134	Moderate positive relationship
10.	Telecommunication	0.2672612	Weak positive relationship
11.	Urban development	0.6190476	Moderate positive relationship
12.	Petrochemicals	0.6454972	Moderate positive relationship
13.	Water Resources	0.8666667	Strong positive relationship
14.	Heavy Industry	0.09128709	No relationship
15.	Defence Production	-0.2581989	Weak negative relationship
16.	Commerce & Industry	0.9534626	Strong positive relationship
17.	Human Resource Development	0.9534626	Strong positive relationship
18.	Home Affairs	1.00	Perfect positive relationship
19.	Rural Development	1.00	Perfect positive relationship
20.	Shipping & Ports	0.554589	Moderate positive relationship
21.	Health & Family Welfare	0.402567	Moderate positive relationship

Source: Prepared by the Researcher

According to Table 6.1, on the basis of degree of relationship there can be six categories of relationships under which sector wise projects with cost and time overruns are correlated.

i. Perfect positive: Sectors like Home Affairs and Rural Development have showed the perfect positive correlation (T=1) between their respective cost and time overruns which clearly signifies that both overruns are perfectly correlated to each other. If one increases the other also rises in the same direction and vice-versa.

ii. Strong positive: Sectors such as Civil Aviation (T=0.9192547), Water Resources (T=0.8666667), Commerce & Industry (T=0.9534626) and Human Resource Development (T=0.9534626) have showed strong positive correlation that interprets healthy relationship between the cost and time overruns of respective sectors as the value of correlation is near to one. The relationship and movement of cost and time overruns is somehow similar as perfect positive correlation.

iii. Moderate positive: Sectors including Atomic Energy (T=0.745356), Petroleum (T=0.650814), Surface Transport (T=0.4682134), Urban Development (T=0.6190476), Petrochemicals (T=0.6454972), Shipping & Ports (T=0.554589) and Health & Family Welfare (T= 0.402567) have shown moderate positive correlation between their respective cost and time overruns. Moderate positive correlation states that there is a good but not healthy relationship between the cost and time overruns of respective sectors. The movement of two variables i.e., cost overrun and time overrun

are in the same direction but not sensitive enough as in the case of perfect positive or strong positive correlation.

iv. Weak positive: Sectors like Coal (T=0.3504383), Steel (T=0.2236068), Power (T=0.3504383), Railways (T=0.2380952) and Telecommunication (T=0.2672612) have showed weak positive correlation between their respective cost and time overruns. It depicts that the movement of cost and time overruns of respective sectors are responding in the same direction but the flow of movement is weak between the cost and time overruns.

v. Weak negative: Sectors such as Fertilisers (T=-0.266666) and Defence Production (T=-0.2581989) have shown weak negative correlation between their respective cost and time overruns. It can be said that the cost and time overruns under these sectors are moving in the opposite direction i.e., if one variable increases other declines and vice-versa. Moreover, the degree of movement is also weak between the cost and time overruns.

vi. Zero: Heavy Industry (T=0.09128709) is a sole sector that witnessed no correlation between its cost and time overruns. It means that if one variable increases or declines reflects a negligible effect or no effect on another variable.

Summary Findings

The present paper was an attempt to study the emerging issues with respect to project implementation and management in the Central Sector Projects. Here, the study was limited to the implementation and management of Central Sector Projects. In order to have better familiarity about the emerging issues regarding implementation and management of Central Sector Projects, objectives were framed on two aspects i.e., quantitative and qualitative. Quantitative aspect tried to analyse the sector wise trends of cost and time overruns for the period 2015-2021. It was found that sectors like Coal, Steel, Petroleum, Power, Railways, Surface Transport and Urban Development witnessed maximum number of projects with cost and time overruns.

Moreover, the correlation between cost overrun and time overrun of respective sectors was determined. And it can be concluded that sectors such as Civil Aviation, Water Resources, Commerce & Industry, Human Resource Development, Home Affairs and Rural Development witnessed high degree of correlation in their cost and time overruns.

Conclusion

The present study has overlooked one of the serious areas of concern under the project implementation and management i.e., cost overrun and time overrun. These unresolved issues result into hindering the overall economic growth of our nation. Resources employed by the government and other project participants got wasted every year due to these overruns. As evident from the analysis, sectors like Coal, Steel, Petroleum, Power, Railways, Surface Transport and Urban Development gave some worrying trends in respect to their increasing projects with cost and time overruns in the past six years. In addition to it, the degree of correlation between overruns was also high in some sectors. These recurrent issues would necessarily shift our focus to the underlying causes and pathways to resolve these issues which have already discussed in this paper.

Implications for Future Research and Policy Formulation

The broad findings of the study would be helpful for the government in many ways. First of all, various sector wise projects with cost and time overruns for a time frame were analysed in a comprehensive manner. It would provide a valuable information to the government agencies regarding various sector's performances in terms of cost and time overruns. It would also assist agencies to keep vigilant about those sectors having maximum number of projects with cost and time overruns and high degree of correlation between the overruns. Thereafter, the government would be in a position to focus on strategies for minimising the cost and time overruns by pinpointing and locating the underlying causes and suitability of its remedial measures.

Undoubtedly, our government has periodically made tremendous efforts with its policies, guidelines and strategies in the areas of project implementation and management; and endeavoured for minimising cost and time overruns. But still there are some recommendations to the government agencies in the light of broad findings of this paper which can be as under:

- The government should lay stress on formulating policies and strategies for specific sectors like Coal, Steel, Petroleum, Power, Railways, Surface Transport and Urban Development to lower the maximum number of projects with cost and time overruns.
- The government should first identify sectors having high degrees of correlation between cost & time overruns to analyse the cause & effect relationship between the overruns and accordingly design some strategies to minimise them.
- The government should ensure the smooth execution of project contracts. Poor performance by contractors, vendors or consultant results into cost overrun and delays. Conflicting situations among participants also hinders the effective implementation of projects. Therefore, a fast-track disputes redressal system should be implemented by the government for speedy negotiation to avoid delays as well as cost overrun issues.
- The government should formulate strategies to fasten the system of getting clearances from different bodies for speedy project implementation and timely completion. The government should work in close cooperation with the concerned authorities to resolve these issues.
- The government should also frame some guidelines to penalise contractors for project delays and cost overrun.
- While the government endeavours to imparts skill and knowledge through its various training programmes but still majority of projects gets delayed and suffers from cost overrun due to lack of technical and managerial skills of personnels. Hence, the government should plan to invest more on human capital development through training courses and workshops.
- The government should formulate policies to establish enormous factories for easy and speedy access to raw materials and equipment because majority of projects suffers from cost and time overrun due to delay in ordering, placing orders and supplying equipment. With this, the time duration of movement of raw materials from manufacturer to construction site will be shortened. And monopolistic practices by vendors will also be eliminated.
- The government should draft guidelines to ensure bonafide project bidding process. It should lay stress on assigning projects to only personnels with expertise and experience to minimise the risk of delays and cost overruns.
- Delays and cost overruns mainly occur due to use of outdated quality equipment. The government should make plans to invest more on research and development division in order to minimise overruns by the use of latest equipments.
- Government should ensure strict enforcement of guidelines related to the safety of project participants at workplace and compensation.

In response to broad findings of the study, it can be concluded that the responsibility and accountability pertaining to project implementation and management are not confined to the government but also to the project participants i.e., contractors, sub-contractors, vendors or consultants. Project participants are the integral part in a sense that they belong to operational level and therefore possesses great acumen in the field of project implementation and management. Therefore, in the light of their importance, some recommendations in connection of formulating strategies by project participants at operational level can be stated as under:

- Inefficient or incapable contractors should not be recommended bidding for contracts.
- Contractors should design comprehensive plans within each sphere in the early stages of project implementation for cost effective and timely project completion.
- Prior to project execution, contractors in close cooperation with the consultants should form a team of competent personnels having skills of handling modern equipments.
- Contractors should ensure availability of required resources of any form on site.
- Contractors should act to maintain a congenial work environment in order to minimise contractual disputes or poor performance due to lack of motivation of labour.
- Contractors should also avoid frequent dismissals of sub-contractors or changes in the composition of team which in turn causes delays and cost overruns.
- Contractors should maintain healthy relationship with suppliers or vendors so as to get timely and sufficient orders.
- Vendors must not exercise the monopolistic practices
- Contractors should not depend on a sole vendor to get its supplies as it would exaggerate monopolistic practices by the vendor.

- Project participants should regularly check the quality of raw materials and other factor inputs.
- Contractors should develop cost control mechanism by identifying and analysing success factors criteria and accordingly compare the performances.
- Contractors should also keep vigilant to take remedial actions on encountering the gaps between the standard and actual performances by the team.

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