International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-9 Issue-4, February 2020

Time and Cost Overrun Analysis in PPP Based Roads and Highway Projects in India

Shraddha Verma, Bobby W. Lyall

Abstract: ***The economic development of any country depends upon infrastructure of roads and highways but its construction, process and maintenance of roads and highways is not as simple as it seems like as growth of roads and highway projects involves massive capital and time. Nevertheless, the government does not have the resources required for the resolution. Public private partnership (PPP) is the resolution of this problem however, roads and highway projects comprises higher degree of risk for the private players which demoralizes private parties from capitalizing in highway projects.***

This paper discovers the prevailing literature on risks involved in roads and highway projects and sources of time and cost overrun in roads and highway projects for the purpose of analysis of major risks which effects in time and cost overrun in PPP built roads and highway projects. This paper also defines the impact of recognized risks over and done with questioner survey.

Keywords: Highways, Roads, Time & Cost Overrun, Risks, Construction process, PPP.

I. INTRODUCTION

The economic development of any country depends upon infrastructure of roads and highways. Roads are considered as an assimilated multi-modal arrangement of transport which provides essential links to airports, railway stations, ports and acts as a reagent for economic progress by playing a vital role in the supply chain management. It is the central mode of transportation in contrast with rail, air traffic and inland water-ways and interprets for about 3.14 percent of GVA and 69 percent of freight and 90 percent of passenger traffic. India has a road system of about 58.98 lakh Kms as on 31 March, 2017 with rural roads 70.65 per cent and National highways 1.94 per cent. Ministry of Road Transport and Highways (MORTH) stated 2018-19 as the 'Year of Construction', and have been creating continual hard work to magnify and elevate the network of National Highways in the country as a result of which road construction in Kms raised to30 Kms per day in 2018-19 compared to 12 kms per day in 2014-15 as mentioned below in Table I.

Table I: Road Length awarded and constructed

Information regarding Road Length awarded and Constructed during the period 2014-15 to 2018-19 (Length in cm)					
	2014-15	2015-16	2016-17	2017-18	2018-19
Award of NHs/ Road Projects	7,972	10,098	15,948	17055	5470
Construction of NHs/ Roads	4,410	6,061	8,231	9,829	10,824
Road construction per day	12	17	23	27	30

Private sector outlay has been slow as private investors are fascinated in short -term investments whereas NHAI and NHIDCL remained focus for long-term borrowing provisions. Moreover the related risks from the estimated revenue streams not appearing from tolls because of ambiguity of traffic.

As construction of roads and highways is not as simple as it seems as roads and highway projects needs enormous funding and time. But the government is short of funds needed for the purpose. Public private partnership (PPP) is the resolution of this problem. PPP comprises an agreement between a public sector authority and a private player, in which the private player offers a public facility and undertakes significant financial, technical and legal risk in the project and the cost the facility is borne wholly by the users of the facility and not by the taxpayer.

PPP project offers following advantages:

- Increased effectiveness.
- Fast execution.
- Enhanced service quality.
- Private financing can upkeep better infrastructure investment.
- Ease life cycle costs.
- A substitute to full privatization.

Nevertheless, highway projects have definite characteristics that lead to a greater degree of risk for private players such as: -

- The willingness of the customers to pay a toll.
- The land acquisition for a road project takes a very long time.
- The investors are also exposed to the traffic risk.
- The administration of a road project is very difficult.

In projects management some serious effects of risk are as follows: -

- Failure to cost estimate that is cost overrun.
- Failure to attain completion date that is time overrun.
- Failure to attain the required value and operation necessities.

Revised Manuscript Received on February 28, 2020.
***** Correspondence Author
Ms. Shraddha Verma*, Assistant Professor, Shri Ramswaroop Memorial Group of Professional Colleges, Lucknow, India.
Prof. Bobby W. Lyall, Professor, Shri Ramswaroop Memorial Group of Professional Colleges, Lucknow, India.

Public Private Partnership in National Highways

Public Private Partnership (PPP) has come to play a major role in the development of national highways. The National Highways Act, 1956 was amended in 1995 with a view to enabling private investment in development, maintenance and operation of highways. The first policy outline for PPPs was announced in 1997 as resolution of the Cabinet of the Central Government. [2] The Government of India introduced many other measures in this course such as to assist borrowing on easy terms and custom duty reduction on construction equipment. [3] But, the initial policy measures did not produce the preferred results. Many researchers recommended that it was the due to the lack of legal outline and policies for the implementation of Public private partnership built projects. However one more reason for the letdown of the PPP in India was the vast number of risks related with the project.

Shortage of legal framework as well as risks related to PPP based roads and highway projects deter private players to take part in PPP based road development projects.

Successful implementation of PPP based highway project, it is necessary to know the significant risks involved in PPP based highway projects and its management strategy.

II. OBJECTIVES OF THE PAPER

- To identify the risks which cause cost and time overruns in Public Private Partnership built roads and highway projects via literature review.
- To identify the risk factor which has higher impact on time & cost overrun based on RII ranking method in PPP based highway projects.

III. LITERATURE REVIEW

MORTH is targeting completion of 60,000 Km of NH in the next five years at an average road construction rate of 40Km per day. Assuming average construction cost of approximately INR 30 crore per Km (including land acquisition cost), and factoring in inflation for road construction cost at a conservative 3%, the total funding requirement over five years estimated at approximately INR 19 lakh crore which amounts to average annual fund requirement of approximately INR 3.8 lakh crore. This analysis only considers fund requirements due to development of 60,000 Km of NHs irrespective of mode of delivery.

However, current sources of funds are projected to meet only approximately INR 2.46 lakh crore of the average annual fund requirements with an average deficit of approximately INR 1.36 lakh crore per annum only for road development part at the rate of 12,000 km per annum. [7]

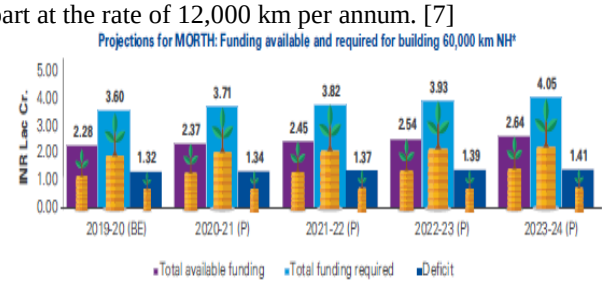


Figure showing funding of National highway

Source: KPMG 2019

Road Transport has emerged as the dominant segment in India's transportation sector which is estimated at 3.2% as against 8.7 % in 2018-19 in India's GDP. The number of vehicles on Indian roads has been increasing at an average stride of 9.12% per annum over the last five years. Therefore, construction of road network undertakes utmost importance in the area of a speedily growing economy. [5]

3.1. Risk Associated with Construction of Highway or Road

Risk is an integral part of the roads and highway projects due to the long time and huge cost are involved in it. Many researches have been conducted to analyze the risks in roads and highway projects, all over the world [6]. They emphasized that highway construction projects carry high risks. They recognized significant risks factors in highway construction projects in China.

In PPP projects, the concessionaire and the Government have to bear many risks. The most important risk factors of roads and highway projects under BOT can be categorized into three phases viz, Developmental phase, Construction phase, Operational phase as mentioned below in Table II. Detailed valuation would be carried on each of the above items before the project is finally taken up for execution.

Table II: Risk involved in different phases of highway project

Development Phase	Technology risk, credit risk, Bid risk.
Construction Phase	Completion risk, Cost overrun risk, Performance risk
Operation Phase	Operation cost overrun, performance risk, liquidity risk, equity resale risk, off-take risk
On-going risks	Interest rate risk, Exchange rate risk

3.2. Time and Cost Overrun in Highway Projects

Cost overruns are more common in infrastructure projects especially in road construction activities. The effects of cost overruns are very high in developing countries associated to developed countries. In developing countries 100% of projects are underwent by cost overruns.[3] For developing countries like India, Road construction activities are much affected by cost overrun due to many factors during the project cycle. The eccentricities among the actual cost earned during construction phase and initially projected cost is known as cost overrun and it is one of the utmost major factors upsetting the successful completion of the whole project. [16]

The major causes of cost overruns and time overruns include:

(1) Improper planning and arrangement, (2) Poor monitoring and feedback method, (3) Poor methods of construction, (4) underestimation of project cost, (5) deferment in payment, (6) inappropriate site management, (7) Insufficient contractor experience are the most significant factors. [17]

- Material Cost
- Inappropriate planning

- False method of estimation
- Management of Contract
- Price fluctuation of materials
- Error in designing
- Deferment in payment
- Financial inability of client
- Financial inability of contractor

IV. RESEARCH METHODOLOGY

Risk which results in cost and time overrun in public private partnership built highway project were recognized from literature review. Total 35 risk factors and 7 types of risk were taken in this paper and with this one objective of this paper were accomplished, that is "To identify the risks which results time and cost overruns in public private partnership built roads and highway projects through literature review." These risks are given below in Table III.

Table III: Types of Risk Factors (35) which Results in Time and Cost Overrun

Sr.No.	Risk factors resulted in Time & cost Overrun	Category
1.	Mishandling by the contractor (Finance, Supplier, Support, Sub-contract)	Technical
2.	Cash flow during construction	Financial
3.	Political interference	Political
4.	Government policies (laws and regulations)	Legal
5.	Variation in the scope of project/extra work	Technical
6.	Lack of equipment/labour efficiency	Technical
7.	Political situation of the country/state	Political
8.	Additional works	Technical
9.	Force majeure (Act of God)	Environmental
10.	Political Force majeure (War, riot, terrorism, strike, etc)	Political
11.	Inflation	Economical
12.	Fluctuation in exchange rate	Economical
13.	Delay in land acquisition	Legal
14.	Design errors & omissions	Technical
15.	Nonpayment of completed work	Financial
16.	Deferment in confirmation from client on cost, quality, time, etc.	Technical
17.	Technology transfer disputes	Political
18.	Increase in taxes/charges	Economical
19.	Shortage of material/labour	Economical
20.	Public interference and protest from environmental activists	Social
21.	Conflicting national and state laws	Legal
22.	Conflict in drawings and specifications	Technical
23.	Permit/Approval related delays	Environmental
24.	Decision making process	Technical
25.	Lack of effective communication among the stakeholders	Social
26.	Contractual relationship among stakeholders	Legal
27.	Inappropriate planning	Technical
28.	Conflicts in execution of work order by subcontractor	Technical
29.	Delay in dispute resolution	Legal
30.	Experience of project team	Technical
31.	Bureaucracy in the stakeholder's organization	Social
32.	Changing of bankers policy for loans	Financial
33.	Non availability of finance from equity participants in time	Financial
34.	Number of construction projects going on at the same time	Technical
35.	Commencement of work without proper site investigation	Technical

4.1. Sampling Technique & Sampling Size

Sampling is defined as a method of choosing a section to signify a whole. In most cases it is unfeasible to conduct a census as it is very expensive and time taking. The sampling techniques implemented in this study were purposive and convenient. The respondents remained purposively selected as definite data and information were required by the researcher to measure the association level of the respondents. A sample size of 50 professionals was taken in this paper.

V. DATA ANALYSIS

Data analysis of this paper was based on the three stages by reduction, display of data and conclusion. After finalizing the data collection, the data was examined with both descriptive data and assuming the RII: relative importance index to find out the ranking factor between all the factors enunciated from the literature review.

Relative importance index formula: -

$$RII = \frac{W}{A/N}$$

Where

W = the weight assigned to each factor by the respondents and ranges from 1 to 5

A = the maximum response integer = 5

N= the total number of respondents

5.1. Data Collection Tool

Questionnaire was used for the primary data collection. The questionnaire was planned specially to ask responses from professionals involved in Public private partnership built roads and highway projects. Questions can be open-ended, close-ended or both. Owing to the research pattern implemented the main questions were designed to be close ended. The questionnaire contains 6 questions. 'Question 1' sought to examine characteristic features of the professionals; work institution; position thought among added issues. 'Question 2' examines the professional's type of organization (Contractor, Client, and Consultant). 'Question 3' examines the personal experience of the professional about accomplishment of highway project within budget time and cost 'Question 4' investigates which project phase of Public Private Partnership built highway project is most risky and the professional were requested to rank the phases based on their experience. 'Question 5' and 'Question 6' examines impact of the factors accountable for time and cost overrun in Public Private Partnership built roads and highway projects and the professional were requested to rank on the likert scale of 5.

VI. FINDING AND DATA ANALYSIS

A total 650 questionnaires were circulated over online survey site, out of which only 66 were reverted and only 50 were found usable for the data analysis. These usable questionnaires generated 7.692% response rate. This shows that, the response rate was quiet small. Nevertheless, respondents were seasoned group of clients, contractors & consultants having average experience of 15 years in highway projects.

Table IV: Organization demographics

A. Organization demographics		
Type of organization	Responses in No.	Percentage
Clients	13	26
Contractors	6	12
Consultants	31	62
Total Respondents	50	100

Table IV depicts that 62% of the respondents are consultants. As a result the findings of the study reveal more of the opinions of individuals who are neither part of the private players nor public sector.

6.1. Findings and Analysis of Question 3

As stated above that the question 3 examines the personal experience of the professional about accomplishment of highway project within budget time and cost. It was an open ended question and the question was: -

"From earlier knowledge of respondent the percentage of roads and highway project completed within budget time and cost?" From this question, it's been revealed that only 32.48% PPP based highway projects are completed within budget time and cost.

6.2. Findings and Analysis of Question 4

As mentioned above that the question 4 investigate which project phase of Public Private Partnership built highway project is most risky. In this questions respondent were asked to ranked the project phases, that is development phase construction phase operation phase and project life cycle on the bases of their experience, as 1=most risky, 2=very risky, 3=somewhat risky and 4=least risky.

Table V: Analysis of risk based on phases

Analysis of Risk based on phases of PPP project (Roads & Highways)					
Project Phases	1=most risky, 2=very risky, 3=somewhat risky and 4=least risky.				
	1	2	3	4	
Development Phase	3 3.54	3 1.85	1 5.46	1 9.15	Percentage of Respondent's rank
Construction Phase	4 3.15	3 0.69	1 4.54	1 1.62	
Operation Phase	6. 77	2 5.92	4 9.92	1 7.39	
Project life cycle	1 3.54	1 2.54	2 2.07	5 1.85	

From the elucidation of the survey data shown in Table V, it has been observed that construction phase of the Public Private Partnership built highway projects is the most risky as 43.15% of respondent ranked it 1 whereas project life cycle phase is least risky as 51.85% of respondent ranked it 4.

6.3. Findings and Analysis of Question 5

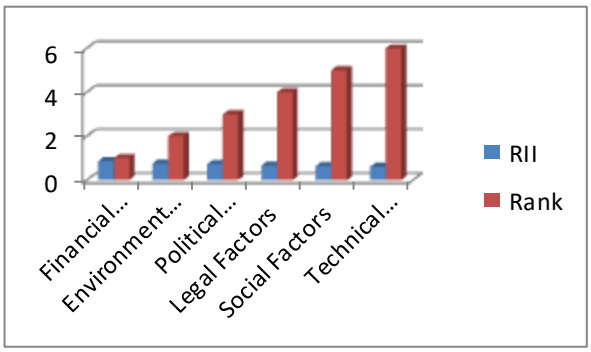
Question 5 investigates the impact of are factors(types of risks), that is technical factors, financial factors, social factors, environmental factors, legal factors and political factors, on Public Private Partnership built roads and highway projects with respect to time and cost overrun and the respondent were asked to specify the impact of each factor on Public Private Partnership built highway projects on a 'Likert rating scale of 1 to 5' with 1 = 'No Impacts' 2 = 'Negligible Impact' 3 = 'Marginal Impact' 4= 'Moderate Impact' and 5 = 'Major Impact'. This 5-point scale was selected to check respondents from providing neutral responses. The factors are ranked on the foundations of their RII which is computed by the formula stated earlier.

TABLE VI: Ranking of various risk factors

Impact of various risk on PPP built highway project in relation to time and cost overrun			
Sr. No.	**Factors**	**RII**	**Rank**
1.	Financial Factors	0.87	1
2.	Environmental Factors	0.76	2
3.	Political Factors	0.73	3
4.	Legal Factors	0.67	4
5.	Social Factors	0.64	5
6.	Technical Factors	0.61	6

Table VI recapitulates the results of the analyses. The table depicts all 'Financial Factors" is the highest ranking factor with RII of 0.87. This is may be due the success of a PPP based project depend upon its financial viability. In addition to that it matches with the results of analysis conducted by researchers in different country & also indicates that the respondents ranked 'Environmental Factors" as second highest factor with RII of 0.76 and Political Factors got the third rank with RII of 0.73. 'Legal Factors' and 'Social Factors' got fourth rank with RII of 0.67 and fifth rank with RII of 0.64 respectively by respondents while 'Technical Factors' is least impactful factor with RII of 0.61.

Figure showing Types of risk factors with RII and rank



Question6 examines the impact of are factors(risks) which may lie under Technical, financial, social, legal, environmental or political risks, on Public Private Partnership built roads and highway projects with regard to time and cost overrun and the respondent were asked to specify the impact of each factor on Public Private Partnership built highway projects on a 'Likert rating scale of 1 to 5'with 1 = 'No Impacts' 2 = 'Negligible Impact' 3 = 'Marginal Impact' 4= 'Moderate Impact' and 5 = 'Major Impact'. The factors are ranked on the foundations of their RII which is computed by the formula stated earlier.

Table VII: Impact of various risk on PPP built highway project in relation to time and cost overrun

Factors	RII	Rank
Deferment in land acquisition	0.87	1
Cash flow throughout construction process	0.82	2
Mishandling by the contractor (Finance, Supplier, Support, Sub-contract)	0.76	3
Inappropriate planning	0.75	4
Variation in the scope of project/extra work	0.74	5
Commencement of work without proper site investigation	0.74	6
Permit/Approval related delays	0.73	7
Decision making process	0.72	8
Experience of project team	0.72	9
Political interference	0.71	10
Government policies (laws and regulations)	0.71	11
Lack of equipment/labor efficiency	0.70	12
Nonpayment of completed work	0.70	13
Non availability of finance from equity participants in time	0.69	14

Delay in dispute resolution	0.69	15
Political situation of the country/state	0.67	16
Shortage of material/labor	0.67	17
Design errors & omissions	0.66	18
Public interference and protest from environmental activists	0.66	19
Delay in confirmation from client on cost, quality, time, etc.	0.65	20
Lack of effective communication among the stakeholders	0.65	21
Conflict in drawings and specifications	0.63	22
Contractual relationship among stakeholders	0.63	23
Additional works	0.62	24
Conflicts in execution of work order by subcontractor	0.61	25
Bureaucracy in the stakeholder's organization	0.61	26
Inflation	0.60	27
Changing of bankers policy for loans	0.60	28
Force majeure (Act of God)	0.59	29
Political Force majeure (War, riot, terrorism, strike, etc.)	0.59	30
Fluctuation in exchange rate	0.59	31
Number of construction projects going on at the same time	0.58	32
Conflicting national and state laws	0.57	33
Technology transfer disputes	0.56	34
Growth in taxes/charges	0.55	35

Table VII recapitulates that 'Deferment in land acquisition', 'Cash flow throughout construction phase', 'mishandling by the contractor (Finance, Supplier, Support, Sub-contract)', 'Inappropriate planning' and 'variation in the scope of project/extra work' are the 5 topmost risk factors which resulted in highest impact on the Public Private Partnership based highway projects while 'Growth in taxes/charges is the risk factor which have minimum impact on Public Private Partnership based highway project.

The table showcases that 'Deferment in land acquisition' is the highest ranking factor with RII = 0.87, have the greatest impact on Public Private Partnership based roads and highway projects related to time and cost overrun. As land acquisition is one of the factor that makes roads and highway projects unsafe for private players as land acquisition for road project takes usually a very long time.

In India, NHAI have adequate legal outline for land acquisition for National Highway Projects although every state has their own legal outline for land acquisition for State Highway Projects which may not be as competent as NHAI's. Though, deferment in land acquisition by NHAI takes place may be owing to deferment in approvals from forest department, changing services and lack of synchronization among NHAI and state authorities.

The respondents ranked 'Cash flow throughout construction process' as second highest factor with RII of 0.82. Maintenance of cash flow in Public Private Partnership based roads and highway project is very challenging as concessioner outlays on the construction of whole project from him and construction of roads and highway projects takes enormous amount of money and time. Consequently, slight change in economic and financial conditions for instance inflation and variation of exchange rates can affect the cash flow throughout construction.

'Mishandling by the contractor (Finance, Supplier, Support, Sub-contract)' acquired the third rank with RII of 0.76. Any type of mishandling by contractor may risk both cash flow and profits.

'Inappropriate planning' got the fourth rank with RII of 0.75. As cited above that roads and highway projects take enormous amount of time and cost. Thus, inappropriate planning at any stage of project by any partaking party will effect in time overrun, cost overrun.

'Variation in the scope of project/extra work' attained the fifth rank with RII of 0.74. Variation in the scope means changes in a project's cost or schedule; it depends upon many factors such as inadequate feasibility study, defective detailed project report, variation in site conditions, environmental apprehensions and variation in design.

From observation of analysis of results of question 5 and 6, it can be established that there is very slight agreement among them as the analysis of question 5 illustrates that 'Technical Factors" has a minimum impact factors on the other hand analysis of question 6 shows that 'Mishandling by the contractor (Finance, Supplier, Support, Sub-contract)', 'Inappropriate planning' and 'Variation in the scope of project/extra work' are 'Technical Factors' and bottom 3 of 5 topmost factors are most impactful which put forward that risk can't be measured in comprehensive form.

VII. RECOMMENDATIONS

Following recommendations would be considered by both government and private players for the successful execution of Public Private Partnership grounded roads and highway projects:-

a. Government consultants should obtain the whole land or as a minimum 80% of the required land erstwhile to concession.

b. Each state government ought to adopt NHAI's legal outline for land acquisition for highway related projects.

c. Government ought to establish financing facilities to concession or contractor to deal with exact risks such as inflation and cash flow problem.

d. Developer and contractor ought to make proper usage of cash flow management software to gain a general awareness about what income and expenses should be anticipated in the future.

e. Contractor ought to use proper labor & material management skills as it supports in maintaining cash flow and upsurges the productivity.

f. Developer and contractor ought to uphold contingency fund for unexpected or emergency event.

a. Developer and contractor ought to expand the managerial expertise of their construction teams by giving appropriate trainings and workshops.

b. The Government ought to create a solitary widow clearance system for Public Private Partnership built highway projects to curtail the permit/approval related delays

c. With the purpose of site conditions and for the planning of estimate, the developer and contractor ought to investigate the site appropriately in advance.

d. Detailed project report should be according to comprehensive survey and investigations, design and technology choice with nominal errors, so that no time and cost overrun takes place owing to changes in possibility of work or magnitudes during construction phase.

VIII. CONCLUSION

The basic objective of this paper were to analyze the risk factors which are accountable for time and cost overrun in road in Public Private Partnership constructed roads and highway projects and to ascertain which of them have the maximum impact concerning to time and cost overrun over Public Private Partnership constructed highway project. Total 35 major risk factors were identified into & out of literature review and a survey were carried out to identify the greatest effectual risk factors midst these 35 major risk factors.

The analysis of survey results shows that Deferment in land acquisition, cash flow throughout construction process, mishandling by the contractor (finance, supplier, support, sub- contract), inappropriate planning and variation in the scope of project/extra work are the 5 topmost risk factors which have greatest impact on Public Private Partnership constructed roads and highway project related to time and cost overrun.

IX. FUTURE SCOPE OF RESEARCH

As there are number of extents associated with time and cost overrun in Public Private Partnership constructed highway projects where further research is required. The subsequent recommendations are thus made for forthcoming research:

A. Future research on the proof of identity of probability of incidence of main risks which marks time and cost overruns in Public Private Partnership built highway projects.

B. Future research on the effect of risk management practice on Public Private Partnership built highway projects.

REFERENCES

1. Anil Kumar Gupta, Dr. M.K. Trivedi and Dr. R. Kansal, (2013). Risk Variation Assessment of Indian Road PPP Projects, International Journal of Science, Environment and Technology, Vol. 2, No 5, pp.1017 –1026
2. Asish Ram, Dr.Pratheeba Paul, (2015). Study on Construction Sequence Delay for Road Infrastructure Projects, Journal of Mechanical and Civil Engineering, Vol. 12, No 2, pp. 15–21
3. Avinash Kumar Singh, Dr. Ankur Mittal and Siddesh k.pai, (2018). Analysis of time overruns in road & highways sector in India using AHP ranking technique, International journal of engineering and technology, Vol. 7, No. 3.29.
4. Dr. Indrasen Singh, PralhadKabra and Anand Kulkarni, (2013). Imperative of Risk Management in Highway Projects, IRC Indian Highways, Vol. 41, No 3, pp. 12 –26
5. El-Sayegh and M. Sameh , (2008). Risk Assessment and Allocation in the UAE Construction Industry, International Journal of Project Management, Vol. 26, No 4, pp. 431– 438
6. Ibrahim Mahamid, AmundBruland, (2011). Cost Overrun Causes in Road Construction Projects: „"Consultants" Perspective"", 2nd International Conference on Construction and Project Management, Vol. 15, pp. 6–10.
7. Ibrahim Mahamid, (2013).„Common risks affecting time overrun in road construction projects in Palestine: Contractor's perspective, Australasian Journal of Construction Economics and Building, Vol.13, No 2, pp. 45-53
8. KPMG (2019), Roads and Highway sector-Current trends and future roadmap, September 2019.
9. Nagesha G & K Gayithri, (2015). Public private partnership's growth empirics in India's infrastructure development, Working Paper, Institute of social and economic change, No. 328.
10. Nagesha G & K Gayithri, (2015). Performance analysis of National highway in public private partnership in India, Working Paper, Institute of social and economic change, No. 336.
11. M.S.Ramabodu and J.J.P. Verster, (2010). Factors Contributing to Cost Overruns of Construction Projects, In the proceeding of ASOCSA 5th Built Environment Conference,
12. July 18-20, 2010, pp. 131–143
13. Mukuka M.J, Aigbavboa C.O., and ThwalaW.D., (2014). A Theoretical Review of the Causes and Effects of Construction Projects Cost and Schedule Overruns, International Conference on Emerging Trends in Computer and Image Processing, Dec. 15–16, 2014, pp. 112–115
14. MuraliSambasivanYau Wen Soon, (2007). Causes and Effects of Delays in Malaysian Construction Industry, International Journal of Project Management, Vol. 25, pp.517–526, doi: 10.1016/j.ijproman.2006.11.007
15. Nicholas Chileshe& Paul DansoBerko, (2010). Causes of project cost overruns within the Ghanaian road construction sector, In the proceeding of ASOCSA 5th Built Environment Conference, July 18-20, 2010, pp. 66–81
16. Ram Singh, 2009. Cost and Time Overruns in Infrastructure Projects: Extent, Causes and Remedies, Working Paper, Centre for Development Economics, No. 181. Retrieved from Centre for Development Economics website http://www.cdedse.org/working-paper- frameset.htm
17. Rajakumar A C, (2016). Analysis of cost overrun in road construction activities-A critical review, International research journal of engineering and technology, Vol. 3, Issue 4, pp-1433-1439.
18. Sunil A.Kage, Mehendra R.Mane, Arjun M. Chougule, (2018). Time delay and cost overrun in construction industry in India, International journal of innovative research in science, Engineering and technology, Vol.7, Issue 12, pp. 11943-11948.

19. Tarek Zayed, Mohamed Amer and Jiayin Pan, (2008). Assisting Risk and Uncertainty in Chinese Highway Project using AHP, International Journal of Project Management, Vol.26, pp. 408–419, doi: 10.1016/j.ijproman.2007.05.012
20. Uma Sekaran, (2003).Research Methods for Business: A Skill-Building Approach, Fourth Edition, New York, NY, USA:John Wiley & Sons Ltd.
21. Pankaj P. Bhangale, Analysis of Time and Cost Overrun to Key Success of High-Rise Commercial Building Project - A Case Study. International Journal of Civil Engineering and Technology , 7(4), 2016, pp.400–405.
22. Asthana Kamla Kant, Bottlenecks in the Delivery Process of Government Buildings in Uttar Pradesh (India) Causing Time and Cost Overrun, International Journal of Civil Engineering and Technology, 9(2), 2018, pp. 693 -704.

AUTHORS PROFILE

Ms. Shraddha Verma, Assistant Professor at Shri Ramswaroop Memorial Group of Professional Colleges, Lucknow. Having more than seven years of experience in teaching industry and has published many papers in National and International Journals.

Prof. Bobby W Lyall, has a long teaching and administrative experience. He has a doctoral degree in Applied Business Economics (Commerce) from Dr B R Ambedkar University, Agra. He has served in various capacities at Shri Ramswaroop Memorial Group of Professional Colleges, Lucknow. He has worked as a Coordinator and Head of Department of Management, SRMGPC, Lucknow for a long time. He has also worked for many years in Industry. Prof Lyall has served almost for two decades as the Professor of Finance and Accounts in the Department of Management. He has supervised doctoral research and published many papers in reputed journals and edited books. He has been member of Editorial and Advisory Boards of many reputed Journals.He is also pursuing Post Doctoral (D.Litt) research. His special interests include Financial and Management Accounting.