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CAUSE OF DELAY AND COST OVERRUN IN INFRASTRUCTURE PROJECTS

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Abstract

This paper focused on identifies causes of cost overrun and delay factors in infrastructure projects. Mainly, a structured review of literature has been conducted for the purpose of knowing extend of time delay and cost overruns experienced by infrastructure projects. To know this issue this paper explored current state of cost overruns and delay in infrastructural projects. Principally, the reviewed of 15 empirical literatures demonstrated different causes of delay and cost overrun. Main findings proposed distinctive factors of cost overrun and delays, and the main of them; pitfalls and errors in design, economic and political instability, bureaucracy of owner, poor experience of contractors, late in payment to contractor for terminate work, incompetent contractor human resources, in accurate scheduling and initial cost estimation by contractor and recurrent design change.

Keywords: *Infrastructure Projects, Cost Overrun, Delay, Literature Review.*

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1.INTRODUCTION

The construction of the infrastructure projects in the world has grown to an accelerated pace day by day for many distinctive reason such as, higher population, better services, technology invention, scare resources, etc. Besides construction projects have been described as a complicated and uncertain in nature (Rashid, 2019). Rapidly growing demand for the infrastructural projects, have attracted attention of construction companies qualified and non-qualified to work in this sector (Mahmood & Sabir, 2023; Rashid & Noori, 2017). Also, an enormous of unqualified investors, individual contractors work in construction industry which

most of them are unfit for doing the job in construction sector (Rashid, 2020; Budur et al., 2023). Recurrent cost override and delay of termination on schedule in infrastructure projects considered to be as a major threat that hazard big resources invested to this sector (Noori & Rashid, 2017). Even unique and good administration systems never find proper solution for continuously raised issues in the construction sector (Rashid & Sabir Jaf, 2023; Budur, 2020). It is therefore pertinent to search for the necessary ingredients and logistics which would be useful to remove all those limitations in the way of implementing infrastructure projects, and drafting alternative strategies so that the ultimate potentials would be realized (Rashid, 2023; Mahmood & Sabir, 2023; Budur et al., 2018).

In this paper different causes of cost override and delay have been identified to address potential causes of poor cost estimation. And the main objectives are; Find out the main factors that affects the cost overruns and delays in infrastructure projects in the distinctive countries. Then, levels of impact of cost overruns and delays have been ranked in terms of the value on estimated cost. And provide and pretend a conceptual model that identify major causes of cost overruns and time delay in infrastructure projects.

2. LITERATURE REVIEW

Many researchers have showed several different factors that lead to cost overruns and time delay in different sort of construction in infrastructure projects (Budur et al., 2023; Rashid, 2017; Fatah & Jaf, 2023). Delay is looked to be the prominent recurrent problems in the construction of projects and it would certainly have an opposite impact on cost, quality, economic feasibility and safety projects success.

In Afghanistan, construction cost overruns are the most substantial problem (facing all parties to a project; suppliers, subcontractors, main contractors and clients). A research by Niazi, G. A., & Painting, N. (2017), aims to identify the significant factors that lead to construction cost overruns in Afghanistan. The outcome of the research is that the key critical causes that potentially result in construction cost overruns in Afghanistan are: corruption, delay in progress payment by owner, problems in financing project by contractors, security, change the order by the owner during construction and market inflation.

Another study by Senouci, A., Ismail, A., & Eldin, N. (2016), investigated cost overruns and delays in Qatari public construction projects. The conduction of regional and international extensive reviews was to get a better understanding of the problem and the various

methodologies that were used to analyze it. The collected data from Qatar public work authority ASHGHAL included 122 public road, building, and drainage projects. The method which was used for data analysis and inference was ANOVA. A regression analysis was also carried on to establish the relationships between project contract prices and cost overruns and to develop prediction models for estimating cost overruns. Two linear regression models were developed for expecting cost overruns for building and drainage public projects, respectively.

Building projects' cost overruns increased with contract prices. On the other hand, cost overruns for drainage projects decreased by increasing contract prices. Significant efforts were spent in collecting data on cost overruns and delays in public construction projects (Rashid, 2018). However, data confidentiality has allowed the collection of enough data to ensure the robustness of the developed regression prediction models.

Then, Adam, Josephson, & Lindahl, G. (2017), reported aggregated rankings of important causes of cost overruns and time delays. These present a strong emphasis on the management aspect as a primary cause of cost overruns and delays. Additionally, there seems to be a trend to deemphasize the role of financial considerations in explaining cost overruns and delays. It is argued that there needs to be a more rigorous assessment of the impact that each factor has on cost increases and delays based on factual observed data as opposed to retrospective accounts from questionnaire respondents. Next, in Bahrain a research by Hasan, R., Suliman, S. M., & Malki, Y. A. (2014), investigated the delays in road projects in Bahrain. Frequency and severity of delay's causes were studied by it, as well as frequency of delay's effects in such projects. The identification and classification of forty seven causes were indicated by the responsibility put into six groups. A field survey was conducted according to a questionnaire which included 36 contractors, 24 consultants and 84 engineers working at Ministry of Works (MOW). The researcher came to a conclusion that there are many causes of delay related to contractors such as the improper planning and scheduling. One of the major causes which are related to the owner, i.e. MOW is delay in decision making. Lack of experience lead to main problems related to consultants. Moreover, two of the most frequent effects of delay were cost and time overruns.

On the other hand, in Asia by Andrić, Mahamadu, Wang, Zou, & Zhong, (2019) explain cost overrun in infrastructure projects. The procurement of infrastructure holds on to be identified by cost overruns resulting in significant academic interest and theoretical propositions on the influential factors. This study has been contributed to this issue through adopting pragmatic

research methodology involving deterministic statistical analysis of real project data from reports as well as a qualitative analysis of these reports to uncover underlying issues from a thematic analysis. Furthermore, the design of the study takes a multi-country view concerning the establishment of the role of contextual and geographical influences on cost overrun. 102 major infrastructure projects were evaluated in covering railways, roadways and energy sectors in different regions in Asia. Findings reveal that differences in the propensity for cost overrun are mostly dependent on a type of infrastructure with rail projects being the most likely to overrun budget. In terms of theoretical point of view, propositions on the influence of project contextual factors are tested highlighting the influence of project size, project type, geographical locations, and the length of implementation period of a project as well as factors which have a relation with political, economic, strategic, and competence in infrastructure delivery which vary across countries.

A paper by Locatelli, G., Invernizzi, D. C., & Brookes, N. J. (2017), addresses the issue of overrun in budget and cost, applying an empirically based methodology to a dataset of 30 European TIPs. The results highlight the significance of financial support from the government and the strong impact by both external and internal stakeholders, mainly in relation to their early engagement and to their nationality. Technological features and the presence of Special Purpose Entities are also correlated with the TIPs performance. These key findings support and contradict the literature, and they are relevant for both policy makers and project managers during the decision making Process, planning and delivery of TIPs.

There is a significant concern related to cost deviations and overruns in public projects, particularly by the local governments. The magnitude of expenses on these infrastructure projects justifies the search for cost deviation reasons, particularly cost overruns. A tendency has also been identified by the existing literature towards cost overruns in infrastructure projects. However, the analysis of cost overruns determinants has mostly focused on endogenous project characteristics. A research by Pinheiro Catalão, Cruz, & Miranda Sarmento, J. (2019), uses a data set of 4,305 public infrastructure projects, of which 3,338 are local projects, carried out in Portugal between 1980 and 2012. Exogenous determinants (e.g. political, institutional and governance, and economic-related) are also taken into the consideration in the analysis. An average cost overrun is identified to an amount of 19% (9 billion Euros in volume, with a 1 billion Euros overrun).

It has been discovered that central governments incur on an average cost overrun of 23% and local governments on 6%. The analysis certified that projects are developed by local governments tend to perform better regarding cost deviations and overruns and that exogenous determinants (particularly the political, institutional and governance environment ones) have a great impact on cost deviations and overruns.

Although, construction projects cost overrun in is a common issue that affect project performance, and Gas-Oil construction projects in Iran is no exception. A paper presents the results of a questionnaire conducted by Derakhshan alavijeh, R., & Teixeira, J. M. C. (2017), to identify and evaluate the relative importance of the significant factors contributing to the Gas-Oil construction industry of Iran as a case study for developing countries.

The respondents of the survey included project owners, contractors and consultants involved in Iranian Gas-Oil construction projects. The results of the survey showed that the main element that causes cost overrun in this industry includes inaccurate cost estimations, improper planning, frequent design changes, inadequate labor/skill availability, and inflation of costs of machinery, labor, raw material and transportation prices. The first three factors include the project consultants' responsibility, qualified consultants appointment and personnel training are strongly recommended to alleviate cost overrun. The paper also provides a review and comparison of findings of a set of similar researches in a number of developing countries.

Many construction projects exceed time and budget. Construction projects in Saudi Arabian are not an exception to this phenomenon. However, the reasons behind time and cost overrun of Saudi Arabian oil and gas construction projects have been studied by Bin Seddeeq, A., Assaf, S., Abdallah, A., & Hassanain, M. A. (2019).

Thus, this paper is an attempt to investigate the main causes of time and cost overrun in Saudi Arabian oil and gas construction projects. Thirty-eight causes of time and cost overrun were identified through the literature and by doing an interview. Responses were obtained from 48 professionals based in the Eastern Province of Saudi Arabia. The respondents were questioned to evaluate the significance of the causes, which were then ranked and a test of agreement was conducted. All participants of the survey agreed that the five major causes of time and cost overrun, combined, were found to be "changing of design and scope by client during construction", "poor planning and scheduling of project", "design errors", "Inadequate comprehension of scope of work at the bidding stage", and "underestimating of cost and

schedules/overestimating of benefits". On the other hand, "changing of design and scope by client during construction" was found to be the major cause of time overrun. Finally, "underestimating of cost and schedules/overestimating of benefits" was respectively identified as the major cause of cost overrun. The findings of this study can provide benefits to project stakeholders who must operate in highly sensitive industry. The findings will also facilitate organizations planning to conduct construction projects in the Saudi Arabian oil and gas industry.

In a paper by Torp, O., & Klakegg, O. J. (2016), look into some challenges with the practice in cost estimation processes and identify possible improvements to overcome them. The aim of this paper is to explain better solutions to some of the major weaknesses identified in current cost estimation practice. They use a case study of decommissioning of Barsebäck Nuclear Power Plant to illustrate how to overcome these challenges. First of all, this is an interesting case that includes challenges related to the project and the cost estimation process, which has made the situation complex and that very few have experiences about decommission of nuclear power plants. Second, we applied an approach that is not yet widely used to develop estimates of cost for this kind of projects. The paper concludes possibility to improve the results of uncertainty analysis of cost estimates. A process which is well prepared, supported by a suitable group of experts that go through a well-structured process, focusing both on risks and opportunities and using a top-down approach can pay compensation for some of the challenges related to cost estimation under uncertainty.

Study by Sohu, Abd Halid, Nagapan, Fattah, Latif, Ullah, (2017) have explained cost overrun, in high way projects in Pakistan. The main objective of this research is to identify factors that cause cost overrun in highway projects of Sindh province of Pakistan. A good questionnaire that is well designed was developed based on 64 common factors of cost overrun from literature review. Developed questionnaire was distributed among30 experts that were selected from owner/client, designer/consultant and contractor who have more than 20 years' experience in highway projects.

3. METHODOLOGY

The collected data was statistical analyzed. After that the analysis results showed that delay process in payment by client, inadequate planning, client interference, poor contract management, delay of decision making, change of scope of project and financial problems

faced by client were most factors caused cost overrun in highway projects. This research will give an alertness to stakeholders of highway projects of Sindh province to avoid cost overrun in the projects.

From the survey of the reviewed scholars as displayed addressed result the significant level of the respondent's perspective on the overall extracted variables on projects completion have been. All factors are ranked in a hierarchical manner and based on the mean value of each factor to recognize the most plausible factors leads to total variance in the project's completion. Accordingly, the following (10) variable factors were extracted out of many distinctive factors to be the significant variables lead to complete projects out of the initial cost and behind the original schedule, as follows;

1- Pitfalls and errors
2- Economic and political instability
3- Bureaucracy of owner
4- Poor experience of contractors
5- Late in payment to contractors of terminate work.
6- Incompetent contractor's human resources
7- Inaccurate scheduling
8- Recurrent design change
9- Inappropriate financing by contractors
10- Inappropriate monitoring and planning by contractors
11- Inaccurate time and initial cost estimates by project sponsor
12- Deficiency of equipment of contractors
13- Incompetent contract management

4. CONCLUSION

Pitfalls and error in design this problem pitfalls and errors in design is attributed to insufficient and unpredictable change in real construction Phase and Lake of comprehensive planning in the process of designing. In some extents, this problem belongs to conduct a traditional method by ministries of government in the project whole construction phase particularly in the process of designing because according to the traditional method, Project sponsor can draw design without contractor's participation and without consult with local authorities. So as a result, if the detailed design has many mistakes it needs to redesign the projects continuously. Thus, the

groups involved in the real construction ground side and the government agencies that conduct public sector projects have typically failed to acquire and produce a unique estimation of costs and implementation scheduled.

Economic and political instability this problem especially political instability leads to decrease in the volume of foreign skillful labors such as technician, engineers and senior consultants. In addition international development corporates would not desire to invest in a terrible political situation. Undoubtedly, most of the large and complex public projects would not be developed without the involvement of foreign labors and the experience of Multinational Corporations. Despite that, particularly economic instability causes cost escalation problem in public projects as confirmed by Alaghbari et, al, 2003.

Bureaucracy of owners Because of the nature of public sector projects especially in the developing countries the frequent client of public infrastructure projects are ministries of government, and there is quite little involvement of private sectors. Although, due to insufficient administrative in developing countries a (Ofori 2000; Ling and Hoang 2010) there is a necessary need to increase the clients and project deck offices information related to the whole process of project development stages. Thus, create a business focus and look at projects as a source of investment lead to alteration from public sector to the private sector. As a result, improve competiveness between the bidders and bring a unique environment to eliminate all difficulties that have been occurred. Otherwise, it will not be easy to complete projects with a high level of satisfaction and the improvements would be slow.

Late in payment to contractors of terminate work Incompetent or delay in financing of infrastructure projects are creates for contractor liquidity problem (Ogunlana, Promkuntong and Jearkjirm, 1996). Otherwise, payment on time and according to the contract arrangement, usually demolish limitation that make difficulties for project objectives (Frim pong et, al.2003 and Oglesby et, al. 1998). From this analysis we conclude that there is a high level of understanding between the respondents to the study survey. Generally, in a great deal of researches project sponsors incompetent financing to project undertaker were very common issue that have made projects not completed on time and with an anticipated cost such as, (Omorige and Radford 2006, Van et,al 2004, Frimpong, et, al 2002, Sweis 2013; Rashid, 2023).

Poor experience of contractors this is easy to concentrate because the factors relating to contractors have an extreme influence on the project completion. Again, insufficiency in the

government regulations to give attention to the contractor's bidder instead of planning of the project undertaker and the ability to manipulate original cost on the location side enhances to share unskillful entrepreneurs and contractors.

In addition, in the developing countries a great deal of the project undertakers are trying to offset the low bid in the form of low wages, poor quality, and lack of co-ordinate (Ogunlana and Olomolaiye 2009), and might bring a great deficiencies to projects.

Incorrect scheduling and initial cost estimations by contractors this problem occurred due to unexpected increasing in materials price, inflation, incompetent training and lack of experience at high level of management (Mansfield, et al.1994). Generally, the component of the projects proposal contains many complex elements such as technological machinery, a great deal of direct material and direct labor, etc. So, Incompetent understanding of the rate of inflation and fluctuation of the direct material prices and direct labor wages over the anticipated level will cause an escalation of both estimation cost and projects schedule. The level of cost estimation variance sufficiently minimize if fluctuation in prices be solved (Okpala and Aniekwu 2006). However, this factor is expressed as a 3rd and 2nd in ranking in a studies examined by Olawale and Sun (2010) in Nigeria and Omorige and Radford (2006) in Nigeria as well, respectively.

Recurrent design change factor create cost escalation and delays in infrastructure public sector projects in respondents perspective. This issue emerged due to incompetent planning and management for the project design process. Or it might be project sponsor and client desire to add more elements during the projects whole developing phase, all these changes need to put more inputs in term of time for engineers that change designs. However, additional time and cost are required for contractors as well as for supply direct and supplementary materials. Finally, the negative consequence of design change on cost confirmed by (Asamoah, 2002), which, discovered design change increased the cost of the gas pipeline project in West Africa from US$ 430 million to US$ 500 million.

REFERENCES

Al-Hazim, N., Salem, Z. A., & Ahmad, H. (2017). Delay and cost overrun in infrastructure projects in Jordan. *Procedia Engineering*, *182*, 18-24.

Alhammadi, A. S. A. M., & Memon, A. H. (2020). Ranking of the Factors Causing Cost Overrun in Infrastructural Projects of UAE. *International Journal of Sustainable Construction Engineering and Technology*, *11*(2), 204-211.

Adam, A., Josephson, P. E. B., & Lindahl, G. (2017). Aggregation of factors causing cost overruns and time delays in large public construction projects. *Engineering, construction and architectural management*.

Andrić, J. M., Mahamadu, A. M., Wang, J., Zou, P. X., & Zhong, R. (2019). The cost performance and causes of overruns in infrastructure development projects in Asia. *Journal of Civil Engineering and Management*, *25*(3).

Alsuliman, G. Bowles, and Z. Chen, "Current practice of variation order management in the saudi construction industry," in *Proc. 28th Annual ARCOM Conference*, S. D. Smith, Ed., 2012, Association of Researchers in Construction Management: Edinburgh, UK.

Budur, T., Abdullah, H., Rashid, C. A., & Demirer, H. (2023). Connection Between Knowledge Management Processes and Sustainability at the Higher Education Institutions.

Budur, T., Demirer, H., & Rashid, C. A. (2023). The effects of knowledge sharing on innovative behaviours of academicians; mediating effect of innovative organization culture and quality of work life. *Journal of Applied Research in Higher Education*.

Budur, T. (2020). The role of online teaching tools on the perception of the students during the lockdown of Covid-19. *International Journal of Social Sciences & Educational Studies*, *7*(3), 178-190.

Budur, T., Abdullah Rashid, C., & Poturak, M. (2018). Students perceptions on university selection, decision making process: A case study in Kurdistan Region of Iraq. *International Journal of Social Sciences & Educational Studies*, *5*(1), 133-144.

Bin Seddeeq, A., Assaf, S., Abdallah, A., & Hassanain, M. A. (2019). Time and cost overrun in the Saudi Arabian oil and gas construction industry. *Buildings*, *9*(2), 41.

Derakhshanalavijeh, R., & Teixeira, J. M. C. (2017). Cost overrun in construction projects in developing countries, gas-oil industry of Iran as a case study. *Journal of Civil Engineering and Management*, *23*(1), 125-136.

Frimpong, Y., Oluwoye, J., & Crawford, L. (2003). Causes of delay and cost overruns in construction of groundwater projects in a developing countries; Ghana as a case study. *International Journal of project management*, *21*(5), 321-326.

Fatah, R. D., & Jaf, R. A. S. (2023). GREEN CONCEPTS AND MATERIAL FLOW COST ACCOUNTING APPLICATIONS FOR MANUFACTURING COMPANY: APPROACH FOR COMPANY SUSTAINABILITY. *Russian Law Journal*, *11*(9s).

Gbahabo, P. T., & Ajuwon, O. S. (2017). Effects of project cost overruns and schedule delays in Sub-Saharan Africa. *European Journal of Interdisciplinary Studies*, *3*(2), 46-59.

Hasan, R., Suliman, S. M., & Malki, Y. A. (2014). An investigation into the delays in road projects in Bahrain. *International Journal of Research in Engineering and Science*, *2*(2), 38-47.

Invernizzi, D. C., Locatelli, G., & Brookes, N. J. (2017, October). Cost overruns–helping to define what they really mean. In *Proceedings of the Institution of Civil Engineers-Civil Engineering* (Vol. 171, No. 2, pp. 85-90). Thomas Telford Ltd.

Locatelli, G., Invernizzi, D. C., & Brookes, N. J. (2017). Project characteristics and performance in Europe: An empirical analysis for large transport infrastructure projects. *Transportation research part A: policy and practice*, *98*, 108-122.

Mahmood, S., & Sabir, R. A. (2023). The Impact of time driven activity based costing on Competitive Advantage in the Kurdistan Region of Iraq Economic Unit. *Central European Management Journal*, *31*(2), 674-690.

Mahmud, A. T., Ogunlana, S. O., Thing, H. W., & Yahaya, I. (2020). Understanding the driving factors of cost overrun in highway infrastructure projects: A review of existing

methodological approach. *MALAYSIAN CONSTRUCTION RESEARCH JOURNAL (MCRJ)*, 21.

Noori, T. M., & Rashid, C. A. (2017). EXTERNAL AUDITOR'S RESPONSIBILITY REGARDYING TO GOING CONCERN ASSUMPTION IN HIS/HERS REPORT: CASE OF KURDISTAN REGION/IRAQ. *International Journal of Research-Granthaalayah*, *5*(5), 138-152.

Niazi, G. A., & Painting, N. (2017). Significant factors causing cost overruns in the construction industry in Afghanistan. *Procedia Engineering*, *182*, 510-517.

Ogunlana, S. O., Promkuntong, K., & Jearkjirm, V. (1996). Construction delays in a fast-growing economy: comparing Thailand with other economies. *International Journal of project management*, *14*(1), 37-45.

Olawale, Y. A., & Sun, M. (2010). Cost and time control of construction projects: inhibiting factors and mitigating measures in practice. *Construction Management and Economics*, *28*(5), 509-526.

Omoregie, A., & Radford, D. (2006, April). Infrastructure delays and cost escalation: Causes and effects in Nigeria. In *Proceeding of sixth international postgraduate research conference* (pp. 79-93).

Pinheiro Catalão, F., Cruz, C. O., & Miranda Sarmento, J. (2019). Exogenous determinants of cost deviations and overruns in local infrastructure projects. *Construction Management and Economics*, *37*(12), 697-711.

Pinheiro Catalão, F., Cruz, C. O., & Miranda Sarmento, J. (2019). Exogenous determinants of cost deviations and overruns in local infrastructure projects. *Construction Management and Economics*, *37*(12), 697-711.

Rashid, C. A. (2018). Efficiency of financial ratios analysis for evaluating companies' liquidity. *International Journal of Social Sciences & Educational Studies*, *4*(4), 110.

Rashid, C. A. (2019). Pricing policy and its impact on the profitability. *International Journal of Finance & Banking Studies*, *8*(3), 101-108.

Rashid, C. A. (2017). The Importance of Audit Procedure in Collecting Audit Evidence/Case of Kurdistan Region/Iraq. *International Journal of Social Sciences & Educational Studies*, *4*(2), 15.

RASHID, C. A. (2020). Balanced Score Card and Benchmarking as an Accounting Tool to Evaluate Morrison's Performance. *Journal of Global Economics and Business*, *1*(3), 59-72.

Rashid, C. A., & Sabir Jaf, R. A. (2023). The Role of Accounting Measurement and Disclosure of Social Capital in Improving Quality of Accounting Information. *Iranian Journal of Management Studies*.

Rashid, C. A. (2023). A requirement for fraud investigation professionals. *Journal of Global Economics and Business*, *4*(12), 75-89.

Rashid, C. A., & Noori, T. M. The Importance of Consultancy Project and How Can It Will Be Adopted in Kurdistan Universities as an Alternative to Replace the Summer Training (2016)/Sulaimani Polytechnic University & Cihan University/Sulaimaniya.

R. H. Clough and G. A. Sears, *Construction Contracting*, New York: Wiley, 1994. F. M. Arain, L. S. Pheng, and S. A. Assaf, "Contractors' views of the potential causes of inconsistencies between design and construction in Saudi Arabia," *Journal of Performance of Constructed Facilities*, vol. 20, no. 1, pp. 74-83, 2006.

Senouci, A., Ismail, A., & Eldin, N. (2016). Time delay and cost overrun in Qatari public construction projects. *Procedia engineering*, *164*, 368-375.

Sohu, S., Abd Halid, A., Nagapan, S., Fattah, A., Latif, I., & Ullah, K. (2017, November). Causative factors of cost overrun in highway projects of Sindh province of Pakistan. In *IOP Conference Series: Materials Science and Engineering* (Vol. 271, No. 1, p. 012036). IOP Publishing.

Sweis, G., Sweis, R., Hammad, A. A., & Shboul, A. (2008). Delays in construction projects: The case of Jordan. *International Journal of Project Management*, *26*(6), 665-674.

Shukla, A., Tripathi, R., & Ramtekkar, G. D. Risk identification based on Historic Data Analysis and Questionnaire Related to Highway construction Projects.

Shah, R. K. (2016). An exploration of causes for delay and cost overrun in construction projects: A case study of Australia, Malaysia & Ghana. *Journal of Advanced College of Engineering and Management*, *2*(1), 41-55.

Torp, O., & Klakegg, O. J. (2016). Challenges in cost estimation under uncertainty—a case study of the decommissioning of Barsebäck nuclear power plant. *Administrative Sciences*, *6*(4), 14.

Venkateswaran, C. B., & Murugasan, R. (2017). Time delay and cost overrun of road over bridge (ROB) construction projects in India. *Journal of Construction in Developing Countries*, *22*, 79-96.