

Studies to Understand The Importance of Risk Management in a Construction Project Procurement During Unprecedented Times

Ishwarya P, Joseph V Thanikal, Subendu Prasad Misra, Mohd. Suhail Khan

Abstract: Risk management is very vital in the construction industry as the industry is full of uncertainties. Every organization follows a risk management process in their projects especially if a project is complex and has a lot of technicalities, but the method of practice may differ in every organization and how importantly used in projects. The COVID-19 lockdown has created serious impacts on the supply chains of the industry. Hence, the study aimed to establish the importance of risk management in the procurement systems by assessing the impacts due to the pandemic lockdown. The data collection was limited in accessing the industry due to the guidelines issued by the government. The study used secondary data collection through a literature survey and a questionnaire survey. The identified risks were qualitatively analyzed using descriptive scales of likely hood and impact. This study has established the importance of risk management in procurement systems and the importance of risk management during natural disasters and other uncertain times. At times when everything comes to a halt and no movement is allowed, it's important to be prepared to save a business from downfall, in case of situations like COVID19 and to mitigate project-specific risks

Keywords: Risk Management, Procurement, Construction projects, Mitigation.

I. INTRODUCTION

The Indian Built Environment is subdivided into the Real Estate Sector and the Construction Sector. Real estate deals with the buying, selling, leasing of properties such as land and buildings whereas the Construction industry deals with the building process of a structure. The construction industry is a large industry that produces projects in different categories such as residential, commercial, industrial, infrastructure, etc., in varying sizes, design, and costs. The industry as a whole is also largely due to the fact it contributes nearly 8% of India's GDP second to the Agriculture industry. The industry provides employment opportunities to a significant percentage of the nation's population. The construction industry is a highly fragmented industry ranging from large companies owning huge market shares to unorganized small firms. A construction project is a result of many contracts and subcontracts undertaken by

small to large firms that agree to complete a work within a specified time and budget. The size of a contract and the price of the contract depends on the nature of the work, type of project, and the technical requirements of the project. Hence, a construction project is only the product of work done by numerous people associated with a contract and its subcontracts. This process of acquiring the works, material, machinery, manpower required for a construction project forms the concept of Procurement in construction. There are different types of procurement routes a client can choose to complete a project successfully. The different routes are Traditional route, Design-Build or the Engineering-Procurement- Construction route, Management Contracting, Construction Management, PPP, BOT, BOOT, DBFT, O&M, Turnkey, etc., from which clients can follow anyone route or a hybrid route from these routes. The risk management process as shown in Fig. 1 is not a technique used to predict the future, but it analyses the possible threats and possible sources from which these threats can arise so that more control can be achieved over the project and organizational objectives hence protecting the welfare of the stakeholders. The theory of risk management consists of four steps Risk identification, Risk Assessment, Risk Response, and Risk Control. Reference [1] on finding the present risk management practices followed in the industry have compared it with the theoretical framework of risk management and how it changes along a Project Life Cycle. The findings supported the influence of identification of risk in the different project cycle. Procurement being important function in a project, how mitigation methods and innovative procurement process are important. Reference [2], [3] has collected data through an elaborate questionnaire made for a focus group of few clients, consultants, and contractors to identify each of their roles in risk management during different project phases. The data collected in this research has identified the importance of risk allocation and contract clauses during the contractual phase to effectively manage risks. It also clearly points out how open, transparent discussions between the project actors reduce risks and the discussion opportunities in different procurement systems [3]. The questionnaire used by [4] to find the importance of risk allocation revealed that, traditional procurement system lack of awareness of risk ownership among client and

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*Correspondence Author

Ishwarya P*, RICS School of Built Environment, Amity University, Noida, India. Email: ishwarayap.mc19n@ricsbe.edu.in

Joseph V Thanikal, RICS School of Built Environment, Amity University, Noida, India. Email: jthanikal@ricsbe.edu.in

Subendu Prasad Misra, Galfar Engineering LLC, Muscat, Sultanate of Oman. Email: titan1231@gmail.com

Mohd. Suhail Khan, RICS School of Built Environment, Amity University, Noida. Email: suhaikhan@ricsbe.edu.in



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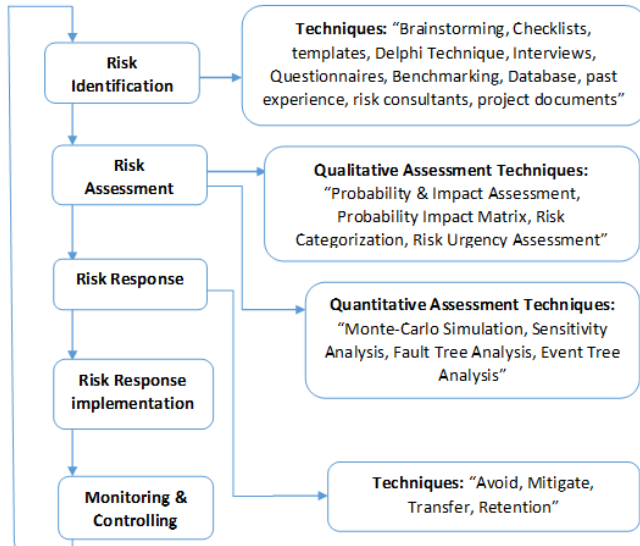


Fig. 1. Risk Management process flow chart

contractor. Reference [5] concluded that the number of people who use these formalized risk management techniques is very small in number mostly small firms with low turnover and most large firms do not follow these techniques religiously. COVID19 lock down brought sudden unrest in the real-estate market, ongoing and proposed developments. Though there are many studies available on procurement risk in projects, not many studies are available with a mitigation plan against an external risk like COVID-19 pandemic. This research work aims in filling this research gap by considering the impacts of the COVID-19 pandemic and formulating a risk mitigation plan using the literature knowledge collected. This research was carried out during the lockdown due to COVID19 and hence, a qualitative approach was more appropriate to conduct this study. The qualitative approach is adopted through literature reviews and a carefully set online questionnaire sent to various managers of the project to understand the current impact. The questionnaire was carefully designed to understand the following:

- Identification of risks in a pandemic situation;
- Impact of risks due to a pandemic on different procurement options;
- Mitigation of risks due to a pandemic in the future;
- Procurement route that will effectively perform during such a crisis.

The questionnaire was divided into sections to understand the industry experience of the person, parameters of time, cost and quality on the projects, impacts in the projects and corresponding procurement route, and to understand the risk management due to a pandemic from the respondent's point of view. The sample comprised of professionals working in the construction industry majorly in contractor, client, or consultancy firms. The only criteria to fill the form is to either have prior experience or should be currently working in the construction sector. The questionnaire was sent to 75 personnels and their detailed profile of respondents is given in Table I below.

Table I: Respondents Detailed Profile

65 Responses out of 75	
Experience in the Industry	Responses
0 to 5	30
5 to 10	1
10 to 20	6
>20	9
Type of Organization of Employment	Responses
Client	8
Contractor	20
Consultant	14
Other	4
Type of Project	Responses
Residential	24
Commercial	10
Industrial	6
Infrastructure	6

II. RESULTS AND DISCUSSION

The risks identified are assessed by qualitative assessment method by framing a likelihood-impact matrix to prioritize the risks so that risks that should be mitigated first will be known. The application of this concept plays a vital role in the risk management process. The scale of assessment followed in the process [1] is given in Table II.

Table II: Risk likelihood scale

Likelihood/Power	Very Low	Low	Medium	High	Very High
Risk	0.1	0.3	0.5	0.7	0.9

The assigned power scale value is multiplied with the impact scale value to find the risk prioritization values in the matrix. The computed values give the level of influence of a risk on a project. The highest values at the right top corner are critical risks and of high negative influence on the project and these are represented in red color. Risks of low negative influence on a project are represented in the left lower corner in green color. The mid values are of moderate negative influence and are represented in yellow color here. The guide matrix is given Table III below:

Table III: HEAT DIAGRAM

0.85	0.085	0.255	0.425	0.595	0.765
0.45	0.045	0.135	0.225	0.315	0.405
0.2	0.02	0.06	0.1	0.14	0.18
0.1	0.01	0.03	0.05	0.07	0.09
0.05	0.005	0.015	0.025	0.035	0.045
IMPACT ↑ LIKELIHOOD →	0.1	0.3	0.5	0.7	0.9
0.005 to 0.05 - LOW		0.051 to 0.15 - MODERATE		>0.15 - HIGH	

Risk impact scale PMBOK 6th Edition (2017) is given in Table IV. The heat map (Figure 2 to 7) discuss the risks that are to be managed or mitigated during different stages of construction. In most cases, cost and time have impacted the procurement and thereby the project. The initial stage of construction, delay in finalization of the contract has caused the delay in the procurement of material and reaching the site on time. During the construction, several components contribute to risk like plant and machinery, labor mobilization, the supply of materials due to transportation delay, idling of labor and equipment due to suspension of works. All these are part of the procurement route selected in the project. Much of the challenges were not visible or studied on the procurement route till the time the COVID19 pandemic unusually hit the real estate market. The questionnaire was sent to people handling different types of procurement methods in different types of contracts like EPC, PPP, turnkey, management contract, lumpsum contract..etc. The results of the questionnaire results were evaluated to understand the importance of each risk and its importance in the opinions of each respondent. The procurement challenges were framed as generic options to capture a broad picture of the situation. The majority faced challenges in labor/ employee procurement due to the migration of people from the projects. Respondents who used the traditional procurement route Labor and Employee procurement was the highest challenge faced in the industry. The fear of pandemic disease spread and the movement ban due to the nationwide lockdown has caused this situation. Reference [6], [7] have also quoted in their articles on the labor procurement risk and the health and safety issues related to it. The next common challenge is the procurement of materials, equipment, machinery, and vendors for works and services owing to transportation issues. In the case of the EPC contract, Cost reimbursement issues were identified and ranked as a priority risk. Due to the idling of labor, machinery contractors had to spend more on the rent and expenses due to the immobility, which caused cash crunch or liquidity issues to the contractors. In such a situation cost of reimbursement will be the major part to be planned. PMC controlled projects also faced the challenge in labor-management and employees working from home.

The study had its limitation to reach out to a number of people for responding to the questionnaire due to the COVID19 and the communication was electronically managed. The fundamentals of risk management very clearly state that simple identification methods can identify the risk and mitigate it very efficiently. The current Pandemic situation mainly impacted the procurement process in the project, since in the majority of the projects force majeure was not considered. Idling of Labor and machinery and its rent, mobilization issues of labor, mobilization issues of materials and machinery, labor health and safety issues, shortage of labor were found to be common challenges in more than 60% of the responses. Projects that used traditional procurement routes had difficulties with procurement issues of labor, materials, and works which lead to a lot of disputes. The lesson learned is, this procurement route will not be successful if the client is not experienced enough to manage or if the risks are not allocated properly. EPC and construction management route of procurement faced the

highest challenges in labor procurement and cost reimbursements. Comparatively, an EPC route is found to be better performing due to the nature of the process.

Risk Severity of the Identified Risks at the Contract and Monitoring stage in a project is shown in Fig. 8 & 9. Heat Map representing likelihood and impact at the Initial and Contract moving stage (Figure 2-4) and Contract Control and Monitoring stage (Figure 5-7) in a project is given below.

- R1 Delay in Approvals
- R2 Delay due to overrunning design period of Consultants
- R3 Delay in Appointing a Contractor
- R4 Delay in setting out
- R5 Delay in Supply of Sand/ Aggregates
- R6 Delay in Supply of Cement
- R7 Delay in Supply of Bricks/Blocks
- R8 Delay in supply of plants & equipment for initial works
- R9 Delay in labor supply
- R10 Delay or Suspension of Excavation Works
- R11 Cost Escalation of Materials & Equipment
- R12 Delay in material delivery for sub-works
- R13 Delay in Plant/Machinery delivery for Sub-Works
- R14 Transportation Delays
- R15 Delay in delivery of material from other countries
- R16 Immobilization of Plants/ Equipment to other sites
- R17 Immobilization of Labor to other sites
- R18 Shortage in Workforce
- R19 Reduced productivity in site
- R20 Health and Hygiene issues of Labor
- R21 Cost Escalation of Materials and Machinery
- R22 Safety and Quality in Materials
- R23 Non-Availability of Specialized tools
- R24 Idling of Labor, Plants & Machinery

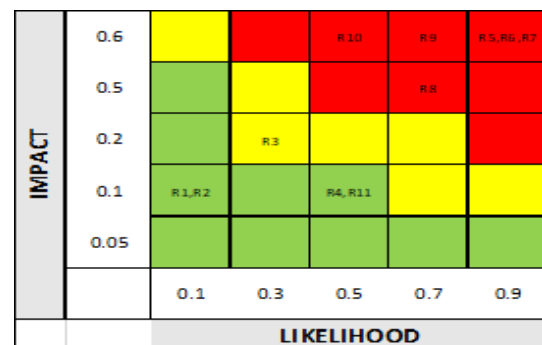


Fig. 2. Heat Map for impact on Time

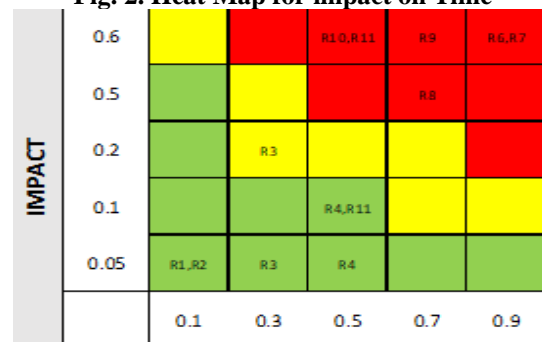


Fig. 3. Heat Map for impact of Cost



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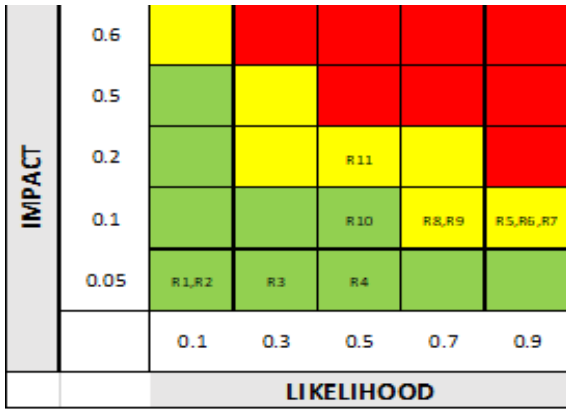


Fig. 4. Heat Map for impact on Quality

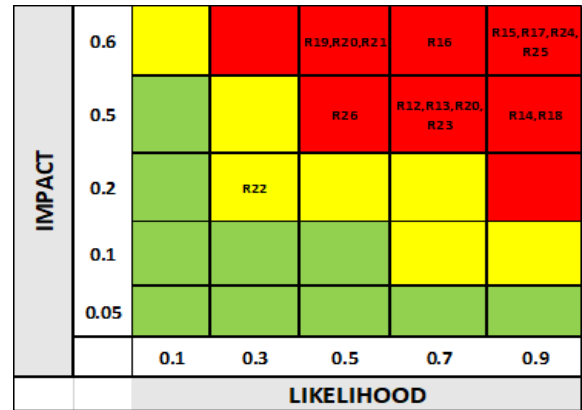


Fig. 6. Heat Map for impact of Cost

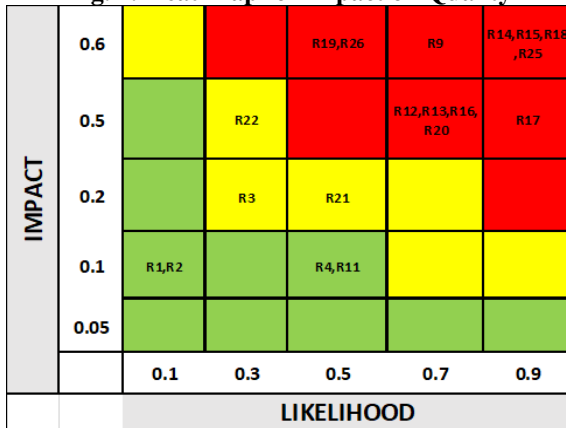


Fig. 5. Heat Map for impact on Time

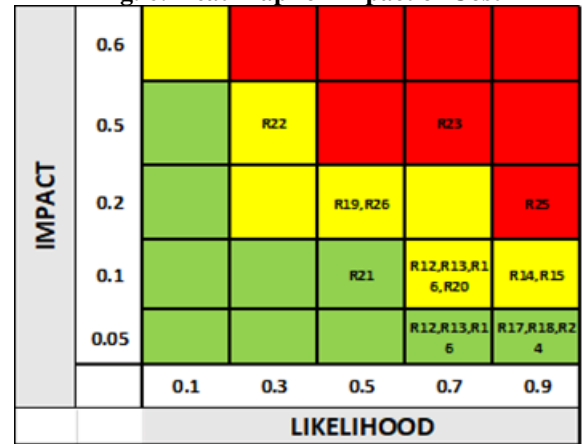


Fig. 7. Heat Map for impact on Quality

Table IV: Risk impact scale PMBOK 6th Edition (2017)

Project Objective	Very Low (0.05)	Low (0.1)	Moderate (0.2)	High (0.45)	Very High (0.85)
Cost	"Insignificant cost increase"	"<10% Cost Increase"	"10-20 % Cost Increase"	"20-40% Cost Increase"	">40% Cost Increase"
Time	"Insignificant time increase"	"<10% Time Increase"	"5-10% Time Increase"	"10-20% Time Increase"	">20% Time Increase"
Quality	"Quality degradation barely noticeable"	"Only very demanding applications are affected"	"Quality reduction requires sponsor approval"	"Quality reduction unacceptable to sponsor"	"Project end item is effectively useless"

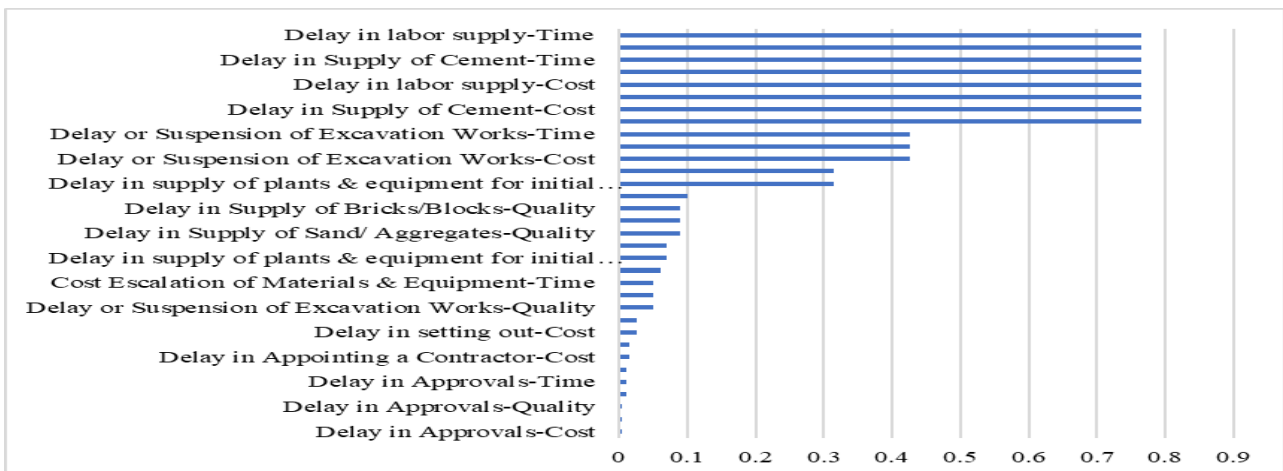


Fig. 8. Risk Severity of the Identified Risks at the Contract and Monitoring stage in a project



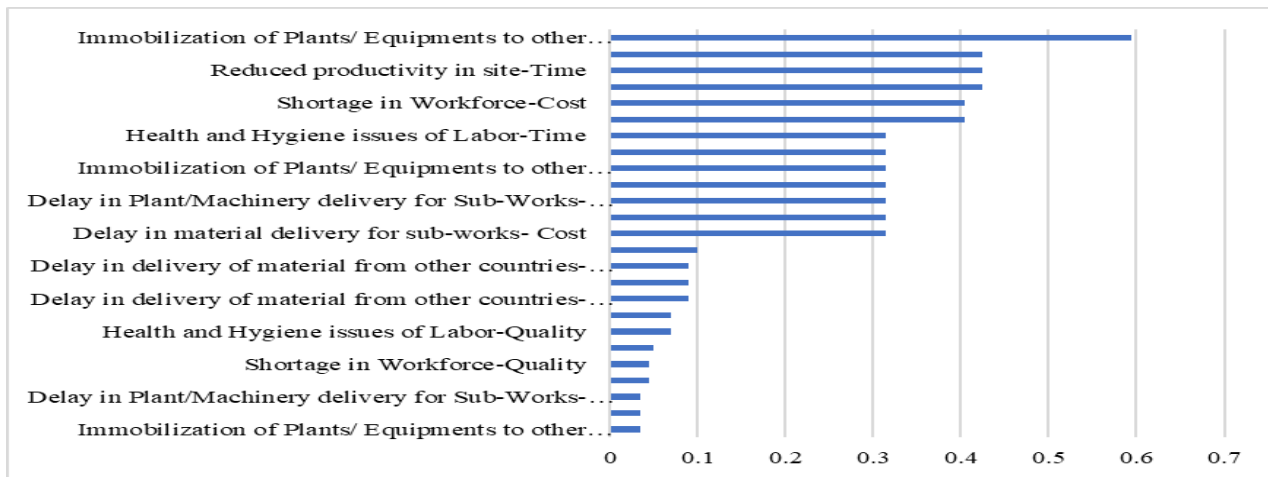


Fig. 9. Risk Severity of the Identified Risks at the Contract and Monitoring stage in a project

III. CONCLUSION

The risk management process ensures the success of a project and helps an organization and its projects to meet its objectives. Not many research has been done on risk management due to natural calamities. This research study presented the importance of risk management in the construction industry and why it is essential during times of uncertainty. COVID-19 pandemic and its long lockdown have been affecting the industries worse than any natural calamity.

The study started exploring into the Indian Construction Industry and its procurement processes that had impact due to Covid-19 pandemic. The lockdown due to the pandemic has mainly impacted the supply chain industry. The study has findings from literature review and actual response from questionnaire survey, that lead to relation between risk management and procurement in projects. Importance to develop risk management plan for a pandemic in the procurement process of the construction industry is well reflected from the survey.

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AUTHORS PROFILE



Ishwaraya P, is currently pursuing MBA in Construction Project Management (2019-2021) at RICS School of Built Environment, Amity University, Uttar Pradesh, India. This paper is a result of hers'Research Based Internship' conducted during April-May-June 2020.



Professor Dr. Joseph V THANIKAL, Ph D. is currently working as Associate Dean and Director of RICS School of Construction, Amity University, Noida, India. He has more than 32 years of academic and research experience in engineering and research institution. He has obtained his basic engineering in Civil Engineering and specialized in Environmental Biotechnology. He was awarded postdoctoral fellowship from 2003-2005, by Institute National de la Recherche Agronomique (INRA), France. He is a member of Canadian Council of Professional Engineers, Canadian Environmental practitioner in education and research by CECAAB, Society of Chemical industry SCI. He is the Chair of Specialist Group Small Water and Wastewater Systems, Distinguished fellow and executive committee member of International Water Association (IWA). life member of Indian Society of Technical Education and served as scientific committee member for several international conferences. He has to his credit: National award by Indian Society of Technical Education, patent awarded by World Intellectual Property Organization (WIPO).



Subhendu Prasad Mishra, is currently working as Planning Engineer in Galfar Engineering & Contracting SAOG, Oman. He has experience of 7.5 years in Construction Industry. Expertise areas are preparing, tracking and reporting project schedules, Preparing and updating delay analysis for EOT & Preparing as well as replying to contractual letters.



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Mohd. Suhail Khan is a Research Associate at the School of Construction, RICS School of Built Environment, Amity University. Currently, he is pursuing a Ph.D. in the field of Planning, Engineering, and Management from Jamia Millia Islamia University, New Delhi. He has more than 5 years of experience, which comprises 2 years in the construction industry and 3 years (and counting) in academics.