



Stakeholder –Related Life Cycle Risks in Repair and Maintenance Works in Construction Management : A Case - Report

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ABSTRACT

Risk unfavorably affects development undertakings like time, cost, extension, and quality and as a result of the quick change in the construction and development business over the most recent 10 years, projects are confronted with additional dangers and vulnerabilities than at any time in recent memory. In the beyond a couple of months, COVID-19 colossally affects the financial activities of the construction and development business, for instance, the general effect of COVID-19 on the construction and development area in India has been assessed at Rs 30,000 crore each day, an examination by KPMG uncovered and presently it turns out to be more significant for a task director to productively chip away at the all-around created gambles and to limit the misfortune. Risks created in the construction and development business can be summarized in two sections: Internals Risks (Technical dangers, Management related gambles, Contract chances, and so on) and External Risks (Environmental dangers, Socio-political dangers, Economy variance gambles, and so on). The absence of correspondence and the absence of comprehension of obligations all through the hierarchy of leadership drives a venture to different disappointments like a quality split the difference, an expansion in costs, or strange postpones in fulfillment of the undertaking.

This case report aims at understanding those fundamental risks and how to categorize them efficiently to understand primary risks, minimum risks, and so on. It provides the user with a model of set questionnaires and surveys to ask and think about before finally arriving at possible conclusions and helps the management to make the right decisions.

Keywords: Risk management, Risk threshold, Qualitative risk analysis, Questionnaire survey

1. INTRODUCTION

The construction and development business has now ended up being one of the quickest developing ventures of today that meaningfully affects the economy of India. If we somehow happened to take a case, in most of the developing countries the essential improvement practices whenever completed add to close to 85% of the typical capital assets, around 15% of their Gross domestic product, and more than half of the capital that is been placed assets into the decent resources. The construction and development business generally gives high work openings. Various errands experience both critical time and cost overwhelms. (Awuni 2019) Huge advancement projects when conceded cause an increase in the general spending plan. The endeavor should be arranged and figured out property and unequivocally to complete it inside given time with great quality work. This has extended the opposition between the development firms in the country. The construction and development firms and the client's way of behaving have made changes due to these occasions. (Patel 2013)

There are 6 steps in the process of risk management and they are as follows:

1. Planning
2. Risk identification
3. Qualitative risk analysis
4. Quantity risk analysis
5. Risk response planning
6. Risk monitoring and control

Accordingly, an impact matrix was formulated which tends to aid the decision-making process. (Szymański 2017)

2. LITERATURE REVIEW

Prefabricated building projects (PBPs) have contributed altogether to tending to Hong Kong's serious lodging deficiency and obliging close to half of the occupants in this thickly populated city. The inventory chains of PBPs include enormous quantities of partners, including clients, architects, primary project workers, carriers, and gathering subcontractors, all of which need to associate with one another through incessant data trades. In any case, cross-line supply fastens are viewed as very complicated, bringing about takes a chance that essentially influences the presentation of PBPs. Supply chain risks (SCRs) are firmly connected with the partners in question and have high interdependency with one another. This paper embraces social network analysis (SNA) to foster the risk organization of the store network of a PBP in Hong Kong to focus on the partner-related SCR. The examination discoveries show that lack of foresight of assets and timetables, unfortunate control of work processes, and unfortunate data dividing among partners are the significant difficulties to the stock chains of PBPs. This is the principal study to think about the unique risk interdependency and related partners in SCRs. (Luo et al. 2019)

Various innate dangers force an orderly risk identification approach to deal with accomplishing production network execution objectives in development projects. Ahmed et al researches the

supply chain risks that take a chance in development projects regarding life cycle and comparing partners. (Ahmed, Ahmad, and Darshi De Saram 1999). The exploration was coordinated in two phases. In the primary stage, a deliberate writing survey joined by a substance examination was led in view of dangers in construction supply chains (CSCs) to recognize research gaps, recommend future exploration headings, and back ensuing advances. Then, at that point, three focus group discussions (FGDs) were performed by industry agents to (1) determine the life cycle risks in CSCs, (2) partner indicated risks to related partners, and (3) ensure the role of each stakeholder in CSCs. Consequences of the content examination show that relationship, correspondence, and supportability are the most often analyzed research regions, while advancement and hierarchical learning, provider weakness, and discussion are neglected in the writing. Because of meetings of FGDs, 135 risks were ordered into 10 periods of construction supply chain life cycle (SCLC) as necessity and request, plan, offering and contracting, fabricating, strategies, hand over, stock, establishment, twisting up, and control and support. Primary project worker, subcontractor, provider, and client were found as the basic choice elements in offering and contracting, establishment, operations, and necessity and request stages, separately. The discoveries can be helpful for specialists by showing research gaps, and for development, organizations looking to expand their inventory network execution through the life cycle and stakeholder approaches. (Jamgade and Sheth 2021)

Koc et al conveyed concentration on construction risks with point by point consideration on the review works coordinated by the scientists throughout the latest fifty years, and in this paper, he has shown a review on the genuine acts of hazard examination being developed endeavors and the study on the exhibiting and assessment of risks being developed stretches out to upgrade the ongoing probability impact show and besides revolving around the progression of the risks uncovering of the undertaking. The paper additionally portrays various frameworks for risk appraisal. The review approves that the composing overview of the investigation works don't have an all-out risk assessment design and structure which ponder different kinds of the impact of the hazard on the trademark objections of undertaking at the same time, since such a framework is fundamental for a reasonable risk examination. The review confirms that the makers give more importance to using 'risk cost' due to its impact on specific endeavor goals and points. The paper proposes including additional instruments and methods and extending the P-I possibility so as to start the possibility of the risk and the cognizance of the risk specialists, and between project gambles and the effect on project condition on possibility assessment. It additionally suggests using the degree of beginning expense of undertaking for example 'risk cost' for assessing the risk impact on the points and targets of the undertaking. (Koc and Gurgun 2021)

Agnieszka Dziadosz et al characterizes that the risk can't be estimated and it is a quantifiable piece of vulnerability, which we can distinguish some events of likelihood and size of injury or misfortune. The risk is the expected deviation of the picked level. The risk can be positive or negative. Hence it is significant to choose the task at the earlier stage and the board of development works. This investigation works on the chief and execution process and gives extra

advice, which helps to choose the best variation of development project utilizing multi aspects approach. This paper presents three kinds of hazard examination they are strategies, benefits, detriments, others, and choice of task. These techniques are unique and variable from one another. The affirmation began utilizing a few subjective factors. This technique relies upon chief and it is extremely basic and simple to utilize. The locales of purpose and legitimate restriction of the recorded methodologies are displayed with the short cases, simultaneously delineating their traits from the test. The evaluation issues, which are the material of activity of the analyzed procedures are not ordinarily interrelated to each other. They show different pieces of varieties of the speculation procedural. (Dziadosz and Rejment 2019)

Alvaro Sanchez-Cazorla et al manage the administration of risks in the development projects poor in practice and research about risk management is least. Their paper zeroed in on the recognizable identification of risk and makes sense of minimization of hazards in the mega projects furthermore, the review conveyed the risks and research about the further regions and methodical surveys or steps to be done. The paper distributed the onward year 2000 has been inspected and the examination is finished by utilizing ATLAS with together agenda were been followed. The commitment of the examination incorporates a bibliometric examination, the paper center around the risk of the board in super tasks and deliberate grouping of the dangers. The vitally two arrangement is initial one is about area considered and second, is connected with partners, and recognizable gaps of the risk in mega projects and examination gaps. Their paper likewise tells about systematization helps in recognizing risk in the megaprojects and following the means implied in risk the board cycle. The paper has answers both scholarly as well as commonsense and subjective examination on risk in mega projects have been done and the systemization of chance by bit by bit helps in recognizable proof, arranging about dangers and observing and control. (Sanchez-Cazorla, Alfalla-Luque, and Irimia-Dieguez 2016)

Perry et al talk about the thought of risk management inside the administration of development projects. The essential significance is on the responsibility which can be made on the elusion of cost and time, goes after conventionally associated with principal projects. The three significant phases of risk management are distinguishing identification, examination, and response are rationed and insights concerning hypothesis momentarily made sense of out. The risk management particularly fits under three periods of life of development projects, pre-approval and advancement of understanding procedure and plan of reports and its application to all of these stages are addressed. (Perry 1986)

Mawdesley et al depict how to comprehend and it gives answers for the construction risks, genuine on the human risk factors. For this reason, numerous surveys are made and it is carried out in private meetings with development specialists. Presently a days risk management has been ordinarily applied across development areas. It barely incorporates the result of human factorials. This paper characterizes the human risk factors mostly in the development, the human risk factors are can't be disregarded at any expense these are viewed in the venture risk management. One more strategy of assessing hazards to also consolidate human risk factors must be made, in which

human risk factors are perceived and analyzed evenly, all through the risk and importance is given for consolidating human risk factors in the improvement in project management. (Thevendran and Mawdesley 2004)

3. METHODOLOGY

Fig. 1 shows the methodology that was followed during the case report study. Numerous stages like risk identification, questionnaire surveys, and qualitative risk analysis were conducted in the second and third steps. (Al-Bahar and Crandall 1990)

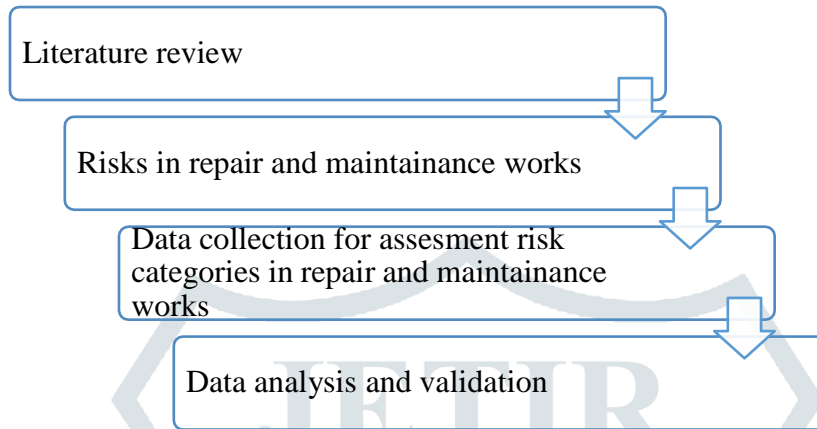


Figure 1 Methodology followed during case report study

3.1 Risk identification

Risk identification is a tedious interaction because as the venture advances new endangers foster through the task life cycle. The risk valuation configuration ought to be consistent to permit the examination of the impacts of one risk even on the other. The identification cycle in the association incorporates the venture colleagues. For this reason, the few risks emerging in the construction process from the formulation, assembly, and construction stage are sorted and recorded. (Bajaj, Oluwoye, and Lenard 1997)

3.2 Questionnaire survey

The questionnaire survey has been conducted on 10 construction companies and the rating for probability impact and urgency and priority were obtained for further analysis. (Jamgade and Sheth 2021)

3.3 Qualitative risks analysis

Qualitative risk analysis includes assessing the likelihood and effect of the different risks and posting the risks to work on the exhibition of the undertaking by making the risks with high need. The valuation of the priority distinguished risks is done on the premise of probability or likelihood of event of risks, the corresponding effect of the risks on the off chance that it works out, and as well as earnestness of risk response. (Goh and Abdul-Rahman 2013). The qualitative risk analysis is carried out by making the following matrices:

i) *Probability – Impact matrix:*

It helps in the appraisal of each risk's need for thought and significance. The ratings for the study for probability and second factor of impact are given as follows:

Probability range is 1-5 where, High- From 4-5 occurrences of probability, Medium - 3 occurrence of probability, Low- Between 1-2 occurrences of probability

Impact range is 1-5 where, High - Risk occurrence can greatly impact the project schedule, performance, time, and cost. The work of an activity cannot be continued and it will be stopped. The progress of the work is delayed due to this risk. Medium - The occurrence of risk that will slightly impact project goals. The work will be continued on at this stage. Low - event of chance will modest affect the objectives of the venture.

Impact – urgency matrix :

It lists the risks, which require a near-term response or the risk that have to be addressed instantly. Urgency range is 1-5 where, High -occurrence of risk that has to be addressed immediately/quickly. Medium - occurrence of risk that has time to proceed with the actions. Low- occurrence of risk has low urgency.

ii) Probability – urgency matrix:

Assess the risks depending upon the probability of occurrence and urgency essential for risk response.

iii) Priority – urgency matrix :

Risk priority is the outcome for rating by relating the assessed probability of risk to occur and its probable impact. Where, Priority = probability x impact (Shen 1997)

Risk Response planning

The Risk Response planning includes determining methods to decrease or take out any threats to the project, also the chances to decrease their impact. It is followed by a qualitative risk analysis. Risks with high priority are addressed by a risk response plan. A risk response owner or risk expert will be allotted to take the responsibility of controlling the risk by introducing essential activities and resources to the budget, project schedule, and management plan as required. The risk response is also responsible for reducing the probability and impact of threats and sometimes increasing the probability and impact of opportunities. (Jaafari 2001)

4. RESULTS AND DISCUSSION

4.1 Data collection

The questionnaire survey was done on ten construction companies and their average results are shown below. Various risks were identified such as technical risks, financial, logistic and construction risks, management, political, and environmental risks. (Thevendran and Mawdesley 2004)

In the table,

- P - Probability
- I - Impact
- U - Urgency
- PR – Priority

Table 1 Technical risks

Sr.no.	Risks		P	I	U	PR
1	Type of construction contract	T1	2	2	2	3
2	Project primer arrangement	T2	3	4	4	4
3	Delays happens in plan and drawings than anticipated	T3	3	4	4	4
4	Managing construction resources	T4	4	4	4	4
5	Lacking examination on location	T5	3	4	4	3
6	Obscure efficiency of assets	T6	3	4	4	4
7	Changes in project degree and prerequisite	T7	2	3	3	3
8	Design plan errors and plan faults	T8	3	4	4	4
9	Subcontractors	T9	2	2	2	2
10	Deficient worker for hire insight	T10	2	2	2	3
11	Inability to convey function according to arranging, planning	T11	2	3	3	3
12	Inappropriate booking and postponement of contactor	T12	3	4	4	3
13	Controlling and checking and execution	T13	2	3	3	3

Table 2 Financial risks (Lam, Chan, and Chan 2010)

Sr.No.	Risks		P	I	U	PR
1	Venture on projects	F1	2	2	3	3
2	Accessibility and undulation in foreign trade	F2				
3	Postpones in laborer compensation	F3	3	4	4	4
4	Expansion in cost of materials	F4	3	4	3	4
5	Delivering of assets	F5	2	2	3	3
6	Import techniques	F6	2	2	2	3

Table 3 Logistics and construction risks (Akintoye and MacLeod 1997)

Sr.No	Risks		P	I	U	PR
1	Nonaccessibility of transportation administrations	L1	2	3	2	2
2	Troubles in arranging plant and equipment	L2	2	2	2	2
3	Newness to neighborhood bodies	C1	2	2	3	2
4	Requests on utilization of nearby firms and specialists	C2	2	2	2	2
5	Construction Technologies	C3	2	3	3	3
6	Nonattendance of assurance on building site	C4	3	4	4	3

Table 4 Management risks (Akintoye and MacLeod 1997)

Sr.No.	Risks		P	I	U	PR
1	Organization connection issues	M1	1	1	2	2
2	Insufficient allotting works	M2	2	2	2	3
3	Unsuitable talented staff	M3	2	2	2	3
4	Vulnerability about connection between project workers	M4	2	2	2	2
5	Conflicts between project bunch	M5	1	2	2	2
6	Asset distribution	M6	2	2	3	3

Table 5 Political risks

Sr.No.	Risks		P	I	U	PR
1	Before tendering	P1	2	2	2	2
2	Acceptance of contract	P2	1	2	2	2
3	Public grievances	P3	2	2	2	2
4	Conclusion of agreement	P4	1	1	1	2
5	Occupant tolls	P5	1	2	2	2
6	Permissions, clearance, approvals	P6	3	4	4	3

Table 6 Environmental risks

Sr.No.	Risks		P	I	U	PR
1	Natural disasters	E1	3	1	3	1
2	Climate and occasional varieties	E2	3	4	3	3
3	EIA reports	E3	1	1	1	1

4.8 Qualitative Risk Analysis

The subjective risk investigation is finished recognized risk and it is finished by taking normal upsides of Probability, Impact, Urgency and need, acquired by the poll overview. The following matrix consists of three main regions High, moderate, and Low which are identified through color codes. The blocks covered with orange color represent high risks and the blocks covered with yellow represents moderate risks and the block covered with green represents low risks. (Nadaf et al. 2018)

4.9 Probability-impact matrix

PROBABILITY	Very likely	5				
	Likely	4			T4	
	possible	3			T2, T3, T5, T6, T8, T12, F3, F4, P6, E2	
	Unlikely	2		T1, T9, T10, F1, F5, F6, L2, C1, C2, M2, M3, M4, M6, P1, P3	T7, T11, T13	
	Very unlikely	1	M1, P4,E1,E3			
		0	1	2	3	4
IMPACT						

Figure 2 Probability Impact matrix

The above matrix shows the probability of occurrence and impact of the risks. from the above matrix, it found that the following risks have a High Probability and Impact T2, T3, T4, T5, T6, T8, T12, F3, F4, C4, P6, E2 where, T2 – project preliminary investigation, T3 – delays and drawing than expected, T4 - Managing resources, T5- Inadequate investigation on site, T6 - Unknown productivity of resources, T8 - Design errors and faults, T12 - Improper scheduling and delay of the contractor, F3 - Delays in worker wages, F4 – Increase in cost of materials, C4 – Absence of protection on construction site, P6 - Permissions, clearance, approvals, E2 - Weather and seasonal variations. (Nadaf et al. 2018)

4.10 Impact-urgency matrix

IMPACT	Very likely	5					
	Likely	4			F4, E2	T4	
	possible	3		L1	T7, T11, T13, C3	T2, T3, T4, T6, T8, T12, F3, C4, P6	
	Unlikely	2	M4	T1, T9, T10, L2, C2, M2, M3, M5, P1, P2, P3, P5	F1, F5, C1, M6		
	Very unlikely	1	P4,E1,E3	F6, M1			
		0	1	2	3	4	5
URGENCY							

Figure 3 Impact-urgency matrix

From the above matrix, it is found that T2, T3, T4, T5, T6, T8, T12, F4, F3, C4, P6 and E2 have high Impact and Urgency. (Nadaf et al. 2018)

4.11 Probability-urgency matrix

PROBABILITY	Very likely	5				
	Likely	4				T4
	possible	3			F4, E2	T2, T3, T4, T6, T8, T12, F3, C4, P6
	Unlikely	2		T1, T9, T10, F6, L1, L2, C2, M2, M3, P1, P3	T7, T11, T13, F1, F5, C1, C3, M6	
	Very unlikely	1	P4,E1,E3	M1, M5, P2, P5		
		0	1	2	3	4
	URGENCY	→				

Figure 4 Probability-urgency matrix

The risks T2, T3, T4, T5, T6, T8, T12, F3, C4, and P6 have a high occurrence of Probability and Urgency. (Nadaf et al. 2018)

4.12 Priority – urgency matrix

PRIORITY	Very likely	5					
	Likely	4			F4	T2, T3, T4, T6, T8, F3	
	possible	3		T1, T10	T7, T11, T13, F1, F5, C3, M6, E2	T5, T12, C4, P6	
	Unlikely	2	M4, P4	T9, L1, L2, C2, M1, M5, P1, P2, P5	F6, C1, M2, M3		
	Very unlikely	1	E1,E3				
		0	1	2	3	4	5
	URGENCY	→					

Figure 5 Priority – urgency matrix

The above priority urgency matrix shows that risks T2, T3, T4, T6, T8, F3, F4, C4, and P6 need an immediate response. (Nadaf et al. 2018)

4.13 Risk Response Planning

The risk response planning for various high risks which are obtained from qualitative risk analysis is as follows (Andi 2006):

T2: Project preliminary investigation: The project preliminary investigation describes the goal of the project and identifies the aims of the project and so it must be clear, assessable, and actionable.

Causes of the risk:

- Inadequately defined scope of the project.
- Indefinite start and completion of the project.
- The goals of the project are not defined.
- Modifications in the requirement by the clients.
- Condition of the market.
- Working Site conditions.

Strategies to manage the risk:

- Project description: Clear understanding of what the project is, how it is to be achieved, and explaining the complete results of the project.
- Project purpose: Suitably defining the purpose of the project and if possible tying the purpose of the project with the planned goals and objectives of the management.
- Project goals: This is one of the most essential elements in the project's preliminary investigation. Providing clear, assessable, and actionable objectives, so that the project can be measured against the goals after completion. Clear documentation of the goals is necessary as the ultimate success of the project depends upon the success of its definite goals.
- Project requirements: Finding the requirements of the service or product that is to be developed. Requirements contain elements such as time, cost, quality, and safety.
- Project assumption: Assumptions made concerning the budget, and schedule, at the beginning have to be considered.
- Project milestone: Setting up milestones, helps to track the schedule and finish the project on time.

T3: Delays in design and drawing than expected:

Design and drawings are the most essential factors for any project. It is the best design and efficient plan that expresses the success or failure of any project. The planning of any project depends upon the requirement of the client, locality, or the market. And the design will ensure the safety of the structure. But in common small scale project design and drawings takes extra time than what is essentially planned. It is due to one of the following project management causes:

- Improper project preliminary plan: The preliminary studies involving studying the need, scope, and necessity of the project from the client's viewpoint is the most significant factor. An improper preliminary survey will lead to common changes in the drawings and further changes in the design.
- Not studying the need of the market or location: Not studying the market will sometime make alterations in the scope of the project in any phase of planning or designing. Re-planning and redesigning will take additional time.

- Not considering the client's requirement: The requirement of the client should be correctly noted. In the situation of client dissatisfaction, the client will mention some changes in the plan and it will require more time.
- Interruption by the client: A client's mindset changes with time and so as his thoughts/concepts and requirements. Several revised plans are to be set before the final plan is agreed.
- The slow pace of work by the planning department: The team which is unskilled, lazy or works slow, leads to delays in completion.

Strategies to manage the risks:

- Well-defined project scope: The project preliminary survey should be carried out properly. The need, scope, and requirements of the project should be thoroughly studied.
- Involvement of client: The client or his representative should be involved in the process of planning. Any modifications in the plan should be carried to the notice of the concerned individual and modifications should be done in the plan.
- Conducting frequent meetings with the client: Common meetings should be conducted with the client to brief them about the flow process of planning and designing. This will improve the connection with the client and increase the client's satisfaction.
- Issuing deadlines: The staff involved in process of planning should work professionally to finish the work in time. Providing deadlines will give maximum output of staff.

T4: Managing the resources:

Managing resources is the process which will classify the resources that are necessary for the progress, execution, development, and continuation of construction works to complete the objectives of the project. Managing resources not only includes all the resources in construction like men, materials, and money but also includes the knowledge of managing staff, machines or equipment, and services.

Causes of risk:

- Nonaccessibility of resources.
- Incorrect specifications.
- Working space limitations/boundaries/restrictions.
- Improperly scheduled working hours.
- Nonavailability of repair and maintenance services at the working site.
- Improper project schedule.

Strategies to manage the risk:

- An accurately defined schedule of the project.
- Identify possible resources necessary as per the project schedule.
- Relating between what is needed, and what is available determines the gap.

- Investment for managing resources.
- Determination of the good way to rent, buy or contact out the resources.
- Following up on fund requirements, need, and gap.
- Suitable supervision and assignment of activity by explained staff.
- Recording the cash flow, and noting the transactions and constraints on their use.
- Agreement at several phases of the process should be prepared.
- Management has to adopt the most useful ways to get the best production by utilizing materials, machines, men, and energy at the lowest cost.
- Plants and equipment should be existing with all supporting resources for maximum efficiency, which can support in completing project goals associated with costs, time, scope, and schedule.

T5: Inadequate investigation on site:

Risk Description: Risk that is integral in the site investigation process are known with major time and cost overruns in construction projects. Risk essential within the ground is often overlooked as an unnecessary cost. Savings made on the site investigation funds show to be incorrect economies. Site investigation for low-rise buildings mentions that costs on the ground investigation should be minimum of 0.2% of the total cost of the project. Project parties will be always exposed to risks of cost overrun, redesigning, and late project delivery, due to inadequate site investigation on site.

Causes:

- Absence of perfect guidance on expenditure to undertake adequate site investigation work as a section of the overall contract sum of the project.
- Ignorance by the contractor and owners.
- Absence of skilled staff on geotechnical and other site investigations, like market conditions, environment, etc.
- No correctly defined management rules and lack of resources in terms of money and materials.
- Market problems.
- Environmental issues. Strategies

to manage the risk:

- Improvement of an effective management system for site investigation and providing of resources.
- Carrying out entire site investigation, planning surveys, specifying, typical and reliable level of drilling, sampling and testing and finally reporting the data.
- Strategies have to be planned, coordinated, and synchronized by the management structure, by hiring geotechnical experts. If ground risks are suspected or known then the problem should be communicated to the monitoring and control, design, and construction departments to avoid the risks being neglected as the project progresses.

- With actual site investigation, ground risks can be at adequate levels and this requires communication, management, and resources of quality, time, and money.

T6: Unknown productivity of resources:

Risk description: Low productivity of resources is generally caused due to ineffective management of construction resources. Effective management of resources can result in a significant reduction in cost and time and therefore it is required for the contractors and construction managers to know the method to assess the productivity of the labor and equipment in different crafts.

Causes:

- Defining and determining real capital inputs a labor inputs when the features of both the elements are miscellaneous and varying.
- Changes in the overall level of rates.
- Variations in demand and supply of materials.
- The difference in the quality of outputs.
- Seasonal changes. Strategies to

manage the risk:

- Suggestions for safety guidelines in hot weather for construction projects in hot weather.
- Well-defined management structure with efficient scheduling, planning, encouraging, directing, and communicating process.
- Onsite management and coordination process.
- Providing laborers job safety.
- Appropriate and accurate decisions to be made by the site engineer and site supervisor, associated with the flow of materials on the working site.
- Providing training to the workers to that they know how to execute the risk process and the capability to perform the task skillfully.
- Having a good directing hand on the productivity aspects to know the integrated composition of production, like equipment's labor and cash flow.

T8: Design errors and faults:

Risk description: Designs are done by architects and will be exposed to human limitations which may cause errors and faults.

Strategies to manage the risk:

- Preparation of designs and plans by expert staff, review, research, sampling instruction, opinion, and other information-based skills both from within the project and outside the project.
- Assigning best-qualified professionals, having education, good knowledge about the work and awareness of the matters at hand.

T12: Improper scheduling and delay of contractor:

Risk description: Delays directly affect the items of work and affect not only increase cost but also have resulting in disrupting effects on the contractor schedule, causing a delay in project completion. The on-time routine of work and on-time payments are the main aims of the parties involved in the construction process i.e. suppliers, subcontractors, and owners and the scheduling delay may be caused by the actions or interaction of these parties.

Causes:

- Variations in design and drawings cause schedule changes and may affect the finishing of the project by the contractor.
- Differing site situations.
- Interference from other trade.
- No timely transport of materials.
- Absence of responsibility by the contractor.

Strategies to manage the risk:

- Schedules should be regularly updated and monitored, to serve the following purpose:
- For correct planning and sequencing of the work.
- Schedules protect the party from reliability for delayed costs.
- A schedule helps the party to determine whether it was delayed by another party or another party was the reason for the claimed delay.
- Owners and contractors often need a well-planned and complex schedule to deal with the high costs of the early performance.
- To monitor delays track the progress of work, and manage subcontractors the contractors should use the procedure of the percentage completion and completion bar chart schedule.

F3: Delay in worker wages:

Risk Description: Delay in payments affects the delay in work progress and this risk directly affects the project and all the stakeholders. Construction works involve a huge amount of money and it becomes tough for the contractors to bear the expenditure when payments get delayed. Delay in payments, after the finishing of work, results in clashes between all the project parties.

Causes:

- Failure of the consultant and owner to accomplish the project in various stages leads to extra work.
- Commencing works to suit the requirements of politicians irregularly and later finding it complex to acquire the required funds.

- Loan sanctions take a longer time
- Failure to raise the funds.
- Inadequate financial planning.

Strategies to manage the risk:

- Knowing the connection of all the parties and goal of the project: many unreliable numbers of project delays are due to things that have no direct contractual relationship within participants of the project but drive schedule milestones such as public benefits and allowing agencies. Knowing these relationships and tying their goals to key project milestones is an effective risk management plan.
- Realizing contracts: notification provisions should be provided for any deviations through the project progress which will affect the withholding of payments.
- Assessing the critical path: identification of the regions where task intervals are separated or not feasible from another dependent task can be done by the schedule risk evaluation. With an appropriate and reliable schedule alterations can be made in the procurement process or reduce risk by knowing the critical tasks.
- Developing simultaneous documents to quantify productivity loss and delays: an additional advantage of tying project controls with risk action plans is that, effectively loss and delays can be known in time as they occur.
- A contract should be signed between client and contractor regarding the timely payments, failure of which will impose penalties.
- The client should have proper provisions of money well before the due date.

P6: Permission, clearance, and approvals:

Risk description: Any project before its start, has to get several approvals and permissions for construction from Municipal Corporation, environmental clearance, permission from forest department in case of cutting of trees, and approvals for plans and estimates in case of applying for loans, etc. All these procedures consume a lot of time to a range few months. This affects the whole project and its flow. This happens because the rules, regulations, acts, and bylaws of government are very difficult and create several steps and procedures. These processes vary from place to place leading to an increase in the difficulty of getting approvals and completing of project.

Causes:

- Not providing the competence.
- Corruption and failure to fulfill necessities, rules, and regulations.
- Pending approval reports.
- Mistakes in the documentation.
- Inadequately defined scope of work.

- Mistakes in planning and other technical aspects.
- No centralized system
- No awareness of the rules and their importance.

Strategies to manage the risks:

- All the governmental procedures should be made simple and well defined.
- The government should simplify the real estate policies.
- A single window system should be presented where all the approvals and permissions related to construction are obtained in one proof.
- A specific period must be declared for each approval and officials should be made to work accordingly.

E2: Weather and seasonal variations:

Risk Description: Construction activities get greatly affected by weather conditions. Weather can affect many features of the project from halting the execution to workers' discomfort. Weathering actions and seasonal variations that affect the work progress are heavy rains, hot and dry weather, and high wind.

Strategies to manage the risk:

- Proper modification and early preparations can help in dealing with local weather conditions.
- Weather records should be collected once the project starts and reports should be maintained.
- The monthly progress report also contains a conversation on the adverse effects of weather so that the project team will be aware of the causes of the delay.
- The Schedule of the project should consider the weather implications.
- In case of rains, activities in the indoors should be planned and executed. (Nadaf et al.2018)

5. CONCLUSIONS

The results were obtained through questionnaire surveys conducted. The methods to classify project risks, that have been particularized for construction projects, have been presented from various points of view from construction companies and firms that may be helping the development of dealing with a project in the planning and construction stages.

Matrix for probability-impact, impact-urgency, probability-urgency, and priority-urgency was plotted and high risks were marked. Brief mitigation plans for avoiding and resolving the risks are prepared.

The project has studied various factors related to risks and some of the outcomes are listed below:

1. The risk management process starts before the project itself.
2. There must be proper coordination between every distinct involved with the project to implement better risk management practices.
3. A record of all the risks that occurred and occurring occurs in the future should be

maintained.

4. Every organization big or small should adopt risk management practices to reduce the effect of risks arising in the project and their impact to reach the project goals.
5. The project should be properly scheduled and monitored.
6. A clear understanding of the project scope explaining the complete outcome of the project.
7. Repetitively changes in design should be avoided in the projects.
8. The wages of the workers should not be delayed.
9. Procurement of materials should be timely on-site.
10. From the results, it is safe to say that majority of the construction projects have no systematic procedure in place to deal with risks. Risk management is done in an exceptionally casual mode. All the risks were recorded and ratings were given for their probability of occurrence, their impact on the project, and the urgency of resolving particular risks.

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