

Awareness, Perception, and Usage of Risk Management among Contractors in Indian Road Construction Industry- A Case Study

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Abstract - The Indian construction industry is vulnerable to multifacet risks and uncertainties and the track record to cope with them is not so good. Effectual analysis and management of construction-related risks remain a huge challenge. The aim was to evaluate the level of awareness, perception, and usage of risk management within the Indian road construction industry, via a cross-section questionnaire survey among systematically sampled 216 contractors, receiving 142 usable questionnaires (66% response rate), followed by qualitative semi-structured interviews (n=142).

The results illustrate existence of unstructured, informal, semitransparent risk management system with a paucity of committed resources to deal with them. Risk identification, analysis, monitoring techniques were used to a bare minimum; risks managed implicitly by intuition and experience; and RM system was presumed as time-consuming, tedious, trivial, unfeasible effort. Risk management-related guidance, planning, training, documentation, and technology were ignored mainly due to meager on-site experience coupled with relatively low understanding of concept and benefits advocated that ultimately caused failure to achieve the project objectives. RM training and assistance, documentation of a proper schedule and risk-relevant data, good communication, coordination, and resource allocation are essential to implement different RM techniques and establish a systematic risk management system.

Key Words: Construction Industry, Project management, Project Risk, Risk assessment (RA), Risk management (RM)

1. INTRODUCTION

1.1 Background

Mohammad Adam et al. (2019) defines risk as, "An uncertain, upcoming, possible occurrence, the phenomenon, or the outcome likely to affect an organization's capability to accomplish its project objectives efficiently". Every commercial organization's profit structure is tangled with some kind of risk and the construction industry is no exclusion [39]. The road construction sector is considered as one of the highest risk-prone industries in view of its complex and dynamic project environments, financial and organizational arrangements, technology, and resource demands coupled with numerous characteristics likewise

time limitation, extraordinary structural and legal situations which creates an atmosphere of high uncertainty [13], [28].

As observed and reviewed by many researchers, Indian road projects have assumed prominence in the past few decades, amplifying the business of varied sectors, thereby increasing the gross domestic product (GDP) of the country [13], [39], [49]. With the continuous rise in road projects, exponential growth in project risks has been a complementary phenomenon [42]. Profound expansion and the introduction of new contracting players every year into the market have drastically accrued competitive bidding and pressure for timely completion of the project. The repercussions of mediocre risk handling and not delivering the project as per its pre-established specifications, duration, and within budget could be disastrous to all the stakeholders concerned, leaving a negative impact in terms of finance, regulatory compliance, and reputation [17], [43]. Construction risks when not contemplated promptly can cause various failures such as cost overruns, project delay, quality shortfall, wastage of time and resources, safety concerns, dissatisfaction among clients and the public [42], [49], [53]. As a consequence, executing agencies may fail to attain the objectives they long for, creating a "trust gap" between clients and contractors. The situation could turn more complex with the involvement of additional contracting parties like subcontractors, suppliers, designers, etc.

Akintoye & MacLeod's (1997) study suggests control of construction risks that are, or might be, exposed; as imperative for the all-around success of the project. Having said that, the study by Landage (2016) elucidates the poor track record of Indian road projects in managing construction risks. Till today, risks are being handled in the industry, but ambiguously. According to KPMG (2015), the reported rate of underperforming projects in India is troublesome. Data suggests that more than half of project owners encountered one or more underperforming construction projects over the past few years, despite conviction in project planning and delivery due to restricted groundwork and shortfall of risk management strategies. Time and again risks that came across during road project periods have not been dealt with satisfactorily and thus have been a headache for implementing agencies as well as higher authorities involved in it. Many researchers like Chandubhai et al. (2019), Landage (2016), Singh et al. (2017) in their study indicated relatively low understanding and experience about risk assessment and management methods as the

major governing factor for project overdue risks resulting in project failure. Luu et al. (2008) in their study found that Indian construction firms overlook risk management on account of unawareness of strategic measures and knowledge about RM. Various studies asserted lack of qualified experts and guidelines, lack of budget, and top management commitment as major roadblocks in the risk management process [10], [28], [52]. Another study discovered contractors' perception of risk based on their instinct and judgment [49].

Tackling unlikely risk cause wastage of resources which if diverted otherwise could be beneficial for the industry [49]. Implementation of a Structured Risk management framework is a comprehensive solution to anticipate and manage all probable risks or hazards in construction project lifecycle. As postulated by El-Sayegh (2015), "Risk management system is an integration of recognition of risks /risk assessment, development of strategies to manage them, and mitigation of risk at various stages of constructions using managerial resources with a coordinated and economic effort to primarily reflect and resolve possible problematic areas.". Incorporating 5 elements (Fig 1) connected to work as an integrated whole, nevertheless, risk management processes do not take off all the risks entirely from the project, but helps alleviate uncertainty in the early phase itself, provides a favorable alternative course of action, ameliorates the possibility of finishing project on time and in the given budget, ultimately helps to achieve the objective and gain shareholder reliability [2]. A study survey by Chandubhai et al. (2019) emphasizes the application of risk analysis and management in the preliminary stage for more effective management of project portfolios. Paper by Thompson and Perry (1992) endorse risk analysis and management to helps stakeholders avoid the most serious effects of risk such as cost over-run, time overdue, and compromised quality work. Applicable to any small or megaprojects, it provides efficiency during practice and a value to the venture [24]. It aids in attaining a competitive edge in the tendering process of construction projects [7]. Many pieces of research such as Aje et al.(2009), Akintoye & MacLeod (1997), Dada & Jagboro (2007), Mills (2001), Simister (1994), explicates the benefits of adopting risk management, with respect to both developed and developing countries.



Fig 1. Risk Management Framework

1.2 The Rationale- Case Study

Studies done on risk assessment and management are mostly in developed countries. Indian studies those available cover construction risk management practice in the national context. India being a diversified nation where socio-economic situation varies from state to state, the characteristics of a project such as project type, size, complexity, number of activities, political and legal factors, environmental factors, etc. also varies geographically. Thus state or region-specific studies could help in better understanding and designing RM processes, strategies, and plans to eradicate or curb risk impact with minimum resources pertaining to that area.

Ministry of Road Transport & Highways - Government of India, Statistics 2015, notified Maharashtra with 1152 no of road projects as one of the top Indian states in the road construction business. Despite opportunities, construction companies here have enduring agonizing outcomes in the form of project delay and financial loss [9,19,38]. Unable to meet the deadline, cost, quality targets on account of unmanageable risks and uncertainties have been one of the key reasons [38,45]. To date, *little has been* published in this regard. The present study is an attempt to address this lacuna in research.

Nashik has been one of the prominent cities of Maharashtra owing to religious, educational, industrial reasons, and being a part of the Delhi Mumbai Industrial Corridor, the number of road projects has shown an upward trend since the last decade. Hence, this study focuses on Nashik construction contracting companies, to acquire an overall idea about their existing risks handling approach, especially the critical ones, and restructure the RM system effectively and efficiently to overcome project risk-related losses and escalate the chance of project success. This paper aims to evaluate the extent of knowledge, attitude, and practices regarding risk management among contractors working under road construction in Nashik. The scope of this study involves collecting information about i) level of

awareness on construction risk management ii) perception about RM iii) usage of RM tools and techniques iv) factors associated with RM usage. Data were collected via a self-administered structured questionnaire survey followed by telephonic interviews and analyzed.

2. METHODOLOGY

2.1 Research flow process

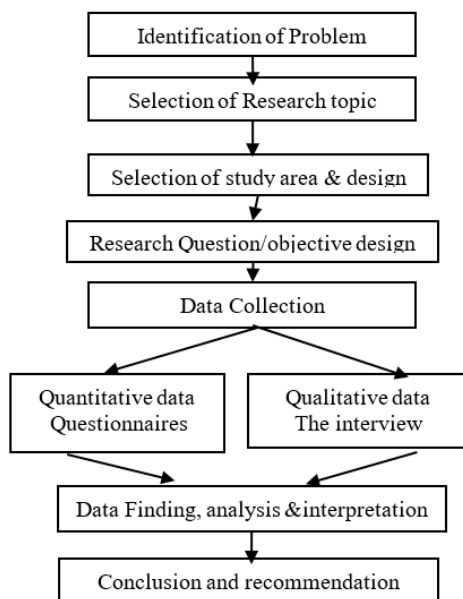


Fig. 2. Research methodology flow chart as used for this study

2.2 Study design

A descriptive cross-sectional study was carried out using a mix of qualitative and quantitative study designs over 8 months' period. Quantitative data was collected via a cross-sectional survey using a self-administered structured Questionnaire followed by qualitative data, collected via telephonic interview, probing for additional explanations of the phenomenon.

2.3 Sampling

The research was conducted in four out of eight private construction contracting companies located in Nashik district; chosen by simple random sampling. In the next stage of sampling, participants were sampled systematically over a population composed of top and middle-level managers and contactors related to risk management (i.e. Managing directors, Director, project managers, senior manager, manager, assistant manager, senior engineer, site engineers, and site supervisor). Those working in the Nashik region, and for at least 1 year in the selected organization were included exclusively to get close detail about prevailing

RM practices within the setup. The remaining staff i.e. Front desk staff, HR and accounts department, labor, class IV staff were excluded. Based on these inclusion and exclusion criteria total of 689 was eligible for the study. As there was no existing data on extend of risk implementation among construction companies specific to Maharashtra state of India, thus assuming 50% of staff to have enough knowledge and use risk management methods, with precision set at 10%, for P-value 0.05% and 80% power of the study, our expected sample size was 196. Considering a 10% non-response rate margin, 216 participants were recruited by choosing every 3rd person as our final respondent through systematic random sampling until desired sample size was achieved.

2.4 Data collection

Consent and approval from owners of the selected organizations were taken prior to data collection. After addressing the objectives of the study and assuring confidentiality, informed written consent was taken from the participants. Participation was voluntary and respondents were free to terminate the interview or not respond to the questionnaire at any time.

2.4.1 Questionnaire Design

A self-administered structured questionnaire was prepared from relevant literature review to investigate awareness, practices, and perceptions on RM. Questions, for greater uniformity of responses and easy administration and comparison (Peterson, 2000), were close-ended and grouped into 2 separate sections:

- Awareness and perception of RM
- Current risk management practices, tools, and techniques in use

Each section had 2 variety of questions. Some were based on the subjective response on 5- point frequency rating scale, which as defined by Friedman et al (1997), is suitable to compute people's perspective toward a range of stimuli such as products, services, etc. This setup evaluates how people perform (or think they perform) actions by using five categories from 'never', 'rarely', 'sometimes', 'often' to 'always' [34]. A similar strategy was employed in UAE by El-Sayegh (2015). The remaining questions were yes-no questions also called polar questions to check information or ask for confirmation. None of the questions had the option of "Not applicable" or "do not know", because allowing the respondent to opt-out surges the number of people selecting these options, thereby, reduces the accuracy and quality of gathered data [29].

2.4.2 Questionnaire Respondents

Out of 216 sent questionnaires, 163 were returned (or collected); however, 21 were incomplete hence rejected;

thus only 142 were included in the analysis, representing a 66 percent response rate. Such response rate is classic in construction sector questionnaire survey and considering Moser and Kalton’s declaration that the result of the survey is regarded as biased and not worthy only if the response rate is less than 30-40%, the current response rate was well accepted for the study.

2.4.3 Qualitative Interview

Above 142 respondents were interviewed via telephone to gather further comments, elaboration, and explanation of the phenomenon. Interviews were straightforward, focused on research questions, conducted ‘in English/Marathi (regional language), each lasting for 10-15 minutes.

2.5 Data analysis

MS Excel was used to analyze questionnaire feedback. Based on the questionnaire, the analysis was divided into two sections: The relative Importance Index (RII) method and the Response Coding method. RII method was selected to rank a particular aspect from "most/always" to "least/never" based on participant’s replies, utilizing the score calculated which depends upon the total responses received in terms of rating scale by the highest scale value multiplied by the number of responses [23].

$$RII = \sum w / (N * A), \text{ where}$$

w = weighting as assigned by each respondent on a scale of 1 to 5 with 1 implying ‘the least used’ and 5 ‘the highest used’, A = Highest weight (i.e. 5 in this case), N = Total number of sample

RII values range from 0 to 1 where 0 signifies no usage, 1 signifies maximum usage. According to Akadiri (2011), five levels transformed from RII values are: high (0.8 ≤ RI ≤ 1), high medium (0.6 ≤ RI ≤ 0.8), medium (0.4 ≤ RI ≤ 0.6), medium-low (0.2 ≤ RI ≤ 0.4) and low (0 ≤ RI ≤ 0.2). All polar questions used the coding method, where response ‘Yes’ and ‘No’ were denoted as ‘1’ and ‘0’ respectively, and described as percentage. Qualitative interview data were collated to analyze certain aspects of study variables.

3. FINDINGS

3.1 Awareness about RM

78% of respondents showed some awareness of RM mainly through study, workshops, and while working on sites (fig. 3). Breakdown of those aware, 52 % and 11% reported having average and adequate knowledge about RM respectively. (fig. 4)

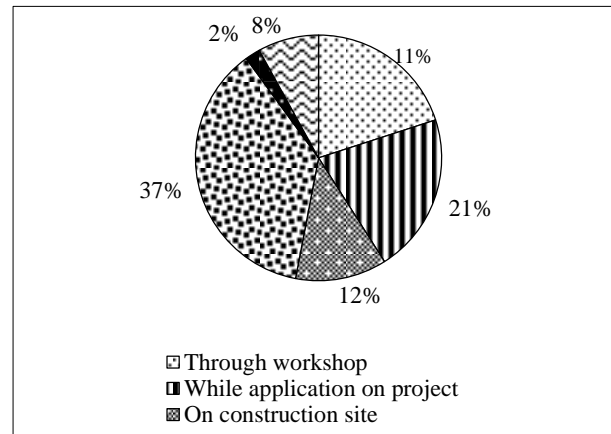


Fig 3: Pie chart shows % distribution of respondents according to the source of RM awareness

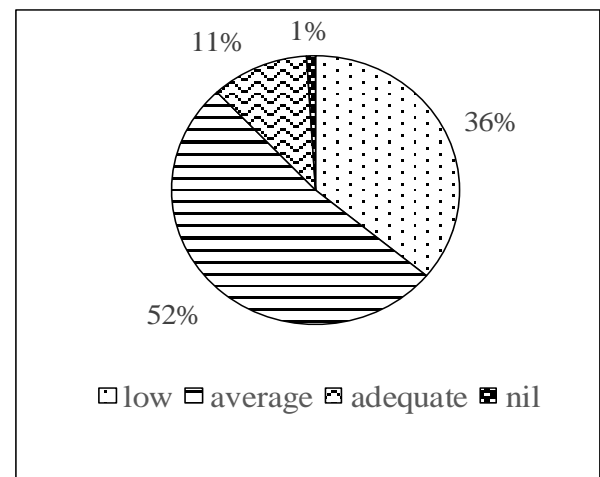


Fig 4: Pie chart shows % distribution of respondents according to the level of awareness about RM

3.2 Current usage of risk management techniques

This section intends to identify respondents extend of familiarity with and usage of different RM tools and techniques.

3.2.1 Risk planning activities

Respondents were asked about Risk planning activities in the form of certain questions. Table 1 showcases the existence of resource estimation and risk allocation clause in the contract document but missing guideline/ reliable data to assist in risk handling. This may be due to limited RM training (32%), lack of RM meetings (15%), and communication gap (16%) among stakeholders i.e. client, contractor, and consultancy with no dedicated staff to guide on RM processes as answered by respondents, indicative of poor RM planning. Interview responses disclosed that the RM plan was neither a part of ongoing project (only 10%) nor included in project strategy (merely 3%). Interviews

further revealed preference to risk assessment and planning only when respondents encounter a problem or risk. The majority even lacked awareness on how to handle these risks and by whom. Moreover, lack of system, expertise, and capacity to track down the risk-related data of ongoing and completed construction projects were reported by survey respondents in complete accord. One peculiar reason given by few respondents was the influence of non-technical staff in the majority of decisions and approvals.

Table 1. Risk management planning activities

Questions	Yes	No
Do ongoing projects have a risk management plan?	10%	80%
Does project strategy include a risk management plan?	3%	97%
Risk management manual/guideline/document provided by the organization?	5%	95%
Do team members discuss Risk management plans during meetings?	15%	85%
Does the project budget include resources for risk management-related activities?	88%	12%
Any person dedicated as guide /manager for risk management in the organization?	0	100%
Does the contract document have any risk allocation clause?	100%	0
Do team members talk/communicate about risk with the client, sub-contractor, and consultant regularly?	16%	84%
Have you received annual Risk management training including health and safety training in the organization?	32%	68%

3.2.2 Risk identification activities:

As it is apparent from Table 2, there was limited use of risk identification processes (16%) during the project initial phase. Among those applied, use of past experience (mean RII 95%) followed by checklist (mean RII 70%) were noted the most while SWOT analysis was used at an average rate and ranked 3rd in rating. The remaining techniques had medium-low to low RII values i.e. less than 40% (table 3). The interviews discovered involvement in RM activities confined to top management. Supervisors and engineers were hardly involved in the process. No system of early risk identification and prioritization was reported. Project risks were handled without referring to the previous record. This can be attributed to responses that highlight the absence of a risk register/risk logbook to guide in risk management.

Table 2. Risk identification activities

Questions	Yes	No
Do organizations use any process to identify risks in the initial phase of the project?	12%	86%
Are all key members involved in risk identification	20%	80%
Do organizations have a list of construction risks ranked based on their priority?	0	100%
Does the organization have a risk register/risk logbook of the previous project?	0	100%

Table 3: Table showing Risk Identification Techniques with RII score

Sno	Risk identification technique	Mean RII%	Rank
1	Checklist	70	2
2	Brainstorming	23	7
3	Assumptions Analysis	0	12
4	Root Cause Identification(The management tends to identify the risk's source)	38	4
5	Experience	95	1
6	Charts	4	11
7	The interviewing or expert opinion	30	5
8	SWOT Analysis	39	3
9	Cause and Effect Diagrams	10	10
10	Industry information	30	6
11	Delphi Technique	12	9
12	Risk review meetings	15	9

3.2.3 Risk analysis

Based on the overall ranking in Table 3 and interview responses, qualitative risk analysis techniques appeared to be more popular due to their simplicity and effectiveness while quantitative techniques were less preferred due to limited understanding and experience. Among qualitative methods, engineering judgment (mean RII % 100), experience (mean RII% 94), and interviewing (mean RII%

83) were used maximally whereas Sensitivity Analysis (mean RII 46%) and Expected Monetary Value Analysis (mean RII 41%) were the quantitative methods favored, but in moderation. On inquiry about the cause, the majority were unaware of the practical implications of different techniques. Some even assumed these methods as time-consuming, costly, tedious activities which could be avoided since many risk-associated issues encountered in the past had been solved by construction experiences and judgment. Findings also showed that almost half of the respondents were trained on Software like MS office and Primavera but used them only for risk planning activities, instead, old legacy processes such as excel sheets and paper logs were in use.

Table 4. Risk analysis activities

Questions	Yes	No
Do Organization use any risk assessment techniques?	30%	70%
Software for risk analysis available in your organization?	0	100%
Training on project management software like Primavera given by the organization?	51%	49%

Table 5: Table showing Risk Analysis Techniques with RII score

Sno	Risk analysis technique	Mean RII%	Rank
Quantitative Assessment			
1	Sensitivity Analysis	46	4
2	Decision Tree Analysis	0	9
3	The interviewing (to get 3 point estimate)	10	8
4	Simulation(Monte Carlo simulation)	0	9
5	Probability Distributions	0	9
6	Expected Monetary Value Analysis	41	5
Qualitative Assessment			
7	The interviewing	83	3
8	Brainstorming	40	6
9	Percentage contingency from historical data	15	7

10	Personal and corporate experience	94	2
11	Engineering Judgment	100	1

3.2.4 Risk response activities

Table 7 shows respondents to rely mostly on risk transfer (mean RII% 85) followed by risk-sharing (mean RII% 70) as a means of risk response whereas use risk reduction in moderation (mean RII% 51). Members had the opinion that the type of risk differs from project to project and its best to take a risk-related decision as per the situation, hence the low score to backup strategy and contingency reserve for time and cost (Mean RII 38%). During the interview, almost 70% responded 'back to back' 'subcontracting as the most favored method of risk transfer followed by transfer to insurance company (60%) and consultancy firm (49%). Responses further revealed control of such decisions in the hands of upper management without employee engagement.

Table 6. Risk response activities

Questions	Yes	No
Do Organization use any risk response techniques?	76%	24%
Do project team members discuss risk response techniques?	10%	80%

Table 7: Table showing Risk Response Techniques with RII score

Sno	Risk response technique	Mean RII %	Rank
1	Risk mitigation/reduction	51	3
2	Risk avoidance	18	6
3	Risk acceptance/eliminate	25	5
4	Risk exploit	5	7
5	Contingency plan/primary and backup strategy	38	4
6	Risk transfer	85	1
7	Risk share	70	2
8	Risk enhance	0	8

3.2.5 Risk monitoring and control activities

Findings suggested bare use of risk monitoring and control activities and perceiving them quite insignificant. Neither internal team members nor outside agencies were involved in risk auditing or risk investigation, hence the negligible RII score (Table 8)

Table 8: Table showing Risk monitoring and control activities with RII score

Sno	Risk monitoring technique	Mean RII %	Rank
1	Incident investigation	5	2
2	Risk audit/inspection	7	1

3.3 Awareness vs Usage of RM System

The findings illustrate that although the majority of contractors (63%) as shown in Fig 3, claimed to be accustomed to project risk management processes, they used them to a bare minimum (as observed from table 1-8) representing an insignificant association between knowledge and usage of RM. Many respondents during the interview established RM system as not a part of project planning.

4. ANALYSIS & DISCUSSIONS

While most previous studies concentrate on certain aspects of construction risk management, this is the first in-depth study that examines risk management in road construction projects. To achieve the objective, awareness, and perception related to risk management and technical methods used in analyzing/assessing risks were reviewed.

The study illustrates that the risk management system in Nashik construction industry is casual, unorganized, with barely any dedicated resources to address the risks and uncertainties. The organization seems to be holding a view that they exercise risk management, however, de factor, employ crisis management, which according to Saiful Islam & Ahmed (2013), Choudhry & Iqbal (2013) is a reactive approach that slays the window of opportunities and initiatives. Organizations execute projects in old traditional style wherein staff approaches RM using a minimum effort.

Knowledge is power but without action is useless and the same applies to risk management. This study shows contractors to have rudimentary knowledge about RM but failed to understand its benefit and use it efficiently during different phases of the project life cycle. Result reveals minuscule use of different reactive and proactive risk management methods although these activities intend to

shield the organization from any discredit, dispute or loss. As observed by Kululanga & Kuotcha (2010) poor enforcement of formal risk management methods causes project substandard performance. Dada & Jagboro (2007) identified mediocre risk assessment and limited use of risk handling methods as a determinant factor for inefficient project performance in Nigerian construction industry. Within the Egyptian context, Hassanein & Afify (2007) discovered a scarcity of practical experience among contractors as an obstacle to RM implementation, a reason consistent with our findings. In a study by Akintoye & MacLeod (1997), familiarity with the techniques below par featured as prime reasons for the disuse of conventional risk management methods among contractors.

Mills (2001) in his research inferred risk management as a traditional concept, applied instinctively with the risk being implicit managed by intuition and informed by experience. This is exactly what is happening here. There is substantial dependence on intuition/judgment and past experience rather than quantitative techniques for risk confrontation, irrespective of professional qualification. Similar results have been reported in studies done in Florida, China, and Malaysia [4], [31], [36]. Popularity of qualitative techniques is probably because the vast majority of risks are considered fairly subjective, hence dealt with experience and judgment. The study by El-Sayegh (2015) in UAE determined contractors to behold risk based on their intuition and past experiences as these methods are simple, straightforward, and inexpensive. Although information about past projects could help to improve preparation for upcoming project risks, given that, as pointed out by Serpell et al. (2015), evidence in Ho and Pike (1992) study intimates the need to employ proven risk analysis techniques (such as decision tree technique) apart from instinctive methods to reform and validate judgments about project risks and uncertainties in an explicit manner.

The approach used in response to a risk reflects the risk type; risk probability, severity, impact; and organization's outlook towards risk management. Concerning our paper, high rate of risk transfer either to subcontractors or project management consultancy (PMC) or through financial means such as insurance, especially when the expected loss is higher, points organization's lack of capacity and innovation to cope with risks, the findings congruent to the one proposed by Ahmed et al.(2011).

According to Akintoye & MacLeod (1997), RM is a sophisticated method whose end result correlates directly with data and time. Many national as well as international studies, for example, Abdul Rahman et al.(2018), Ansari & Swamy (2018), Dada & Jagboro (2007), Gujjar et al.(2020), Harner (2010), Yirenkyi-Fianko & Chileshe (2015), delineate the role of risk assessment in creating a significant impact on project execution with respect to time and cost. Unsurprisingly, respondents of our survey perceive risk management systems as unfeasible, laborious, trivial effort rather than value-added activity. They contend that the

number of calculations involved in these processes is redundant to achieve the targets of time, budget, and quality standards.

As opined by Harner (2010), proactive leadership, a positive attitude along with adequate resources, and assistance from top management are pre-requisite for effective risk handling. Conversely, in Nashik construction companies, risk handling practices and measures came off to be lacking in areas such as dedicated personal/leader/team allotted for risk management; support, and assistance of top management for RM. Transparency in data sharing both among internal staff as well as with external agencies like clients and consultants was missing. This denotes a lack of trust among team members and key stakeholders. Possible reasons could be fear, as reported in many studies, that was driving team members to protect their own interests; misaligned expectations, and confusions over roles responsibilities owing to which team might be “communicating” but the understanding was not happening. These findings are coherent with those in the study by Aje et al. (2009) in Nigerian context, Hassanein & Afify (2007) in Egyptian context, and Akintoye & MacLeod (1997) in UK context.

The study also acknowledges low confidence among staff as far as risk management is concerned. Their level of perception about risk importance, risk severity at various steps of the project contradicts their risk handling attitude. The comments are not particularly surprising providing, on-site and software-based RM training and meetings were a rare phenomenon. Many studies, however, have endorsed RM-related education, training, and meetings to narrow the gap between theoretical knowledge and practical application. For example, Loosemore et al (2006) suggested that the best way to exercise construction risk management is to have a clear-cut approach backed by substantial information. If absent, result in conflicts that are unfavorable for project objectives. A study by Tang et al. (2007) affirms reliable information as the crucial element in the phases of risk assessment. Kliem and Ludin's (1997) study links quality of information to quality and accuracy of decisions. Researchers like Lyons & Skitmore (2004), Schumacher et al.(1997), Mohammad Adam et al. (2019) claimed that appropriate risk management lies in strengthening risk planning and identification, and risks or their impact can best be suppressed when they are recognized in the starting point. Counterproductive to these arguments, Nashik construction industry follows a 'then and there' strategy to handling risks without any backdrop of reliable data or any contingency plan indicating a deficiency of proficiency, knowledge, and quality data to help formulate informed strategies. This can be elucidated by the fact that activities such as documenting RM plan, prioritizing a list of risks, recording risk activities of ongoing and completed road projects, developing knowledge bank at managerial level, preparing backup plans, etc. were seldom employed.

As far as digital advancement is concerned, the construction industry has been evolving for centuries with many innovative solutions supported by technology, for example, Software like Primavera, Staad-Pro to make intricate activities simple [11]. Nonetheless, the present study identified staff unacquaintance with the use of computer-based risk analysis software in conjunction with project management software. This questions organization's digital skills and capability to upgrade with technology and rather stick to superseded paper log and excel bookkeeping.

5. CONCLUSION AND RECOMMENDATIONS

To conclude, risk management is an indispensable task that aims to preclude the unfavorable aftermath of risk events that could pop-up, during the construction project period. This study was conducted to reveal many aspects of risk management in Nashik construction contracting industry and obtain a better understanding of how risks are handled by them. It is apparent from the foregoing analysis that the risk management system here shows a gloomy picture. Even though the notion of risk management is becoming more popular in the road construction sector, its practical implication along with the usage of RM tools and techniques is quite diminished here. It is apparent from the study that the contractors are hardly willing to adopt RM presuming it as a time-consuming, expensive, effortful, and avoidable task. This unanimous viewpoint conveys the extend of certainty to the barrier for implementation of an effectual RM system. Organizations have a dearth of expertise, assistance, capacity, communication, and documentation to establish a structured risk management system. All above findings give a vivid idea of managerial weakness and the organization's failure to manage risks that calls for concern

However, it is expected that this attitude will change once the findings of the research are spread out and RM methods are adopted. Simister's (1994) study survey posits risk management as one of the focal activities in the steps of successful project completion. Shakil et al.'s (2013) study validate RM to help reduces project damages and escalate the possibility of timely project completion and in the given budget and, as mentioned by Akintoye & MacLeod (1997), contractors should be made aware of the advantages of implementing risk management on road projects. There is a need to transform awareness about RM concept into practice. All contracting professionals require expertise, capacity, assistance, and reliable data to manage risks, that can be attained via periodic recording and reviewing project risk activities and other historical databases, formal and informal RM training and meetings to ensure data sharing and transparency, board-level leadership from top management and committed RM team/consultant for better risk evaluation and prompt solutions. The extend of employing risk management depends on the manager's concerns, time involvement, and knowledge of different RM techniques along with technology tools [12]. All organizations need to build a culture where their manager

and construction professionals are sensitized to what risks are lurking in the shadow of the project and thereby understand and implement pertinent project risk management processes. They are required to devote attention to RM planning, forethought different risk handling strategies and their viable outcomes, and allocate resources explicitly to withstand risks and uncertainties. Instead of the traditional top to down approach, down to top approach and cross approach should be followed so that the employee's voice is heard. This could curtail conflicts thus creating trust, harmony, and openness in the working environment. Organizations could establish a system to ensure RM practices are being followed – e.g. implementing a performance assessment scoring system (PASS) as an unbiased mechanism to rate contractor's performance against the quality work done as per RM protocols.

Future of the study

As a suggestion, further research in this realm could be done by designing, testing, and validating a comprehensive risk management framework for Nashik road projects to correctly identify risks, measure their impact, probability of occurrence, mitigate them and reap the benefits advocated by implementing risk management practices. Additionally, a future study involving all stakeholders, private and public i.e. project management consultants (PMC), clients, contractors, and sub-contractors could be done for more clarity on extend of RM awareness and usage in road construction industry. Also, testing and application of the results to construction companies of other districts/state/developing countries could be done given that they have similar problems of project failure. It is recommended that subsequent work on RM be expanded to encompass almost all areas of the country.

Study Limitations and Significance

This study has certain limitations required to be acknowledged. Firstly, the sample included contractors exclusively, hence exempting consultants and clients from the study. Secondly, the study used cross-section data rather than longitudinal, limiting the analysis of RM attitude and practices over a period of time, suggesting a need for further study. Thirdly, the area of study was limited to Nashik region representing geographical limitations. Another relevant constraint was the paucity of Indian research in this regard, thus limiting the option of possible illustrations and sources for data triangulation. Lastly, since the questionnaire was devised using real-time data collection, different practical and subjective viewpoints could have been overlooked.

Notwithstanding these noted limitations, the significance of this study lies in a formerly unexplored area within the Indian context. One of the cardinal contributions of this study is that it presents a real-time picture of awareness, perception, and usage of RM methods in Indian road construction sector with special focus on Maharashtra state, that could make a basis for future approaches to rectify gaps and implement an effective risk management

framework, henceforth contribute to the effective planning of forthcoming projects. These findings may be useful to related professionals and groups (client, project management team, contractors, etc.) and could help many companies (new & old) convoluted in the road construction to better evaluate and respond to the risks around them; develop a preventive mechanism and; ensure minimal risk-related losses and maximal opportunities through better budget planning, time management, and performance standards.

Ethical consideration

The research was conducted in a professional manner and with high standards, emphasizing the main subject of the research. Without being biased or forming own opinions or having own agenda during analysis, the interpretation was purely focused on questions and answers provided by the participants, after taking informed consent. Participation confidentiality was maintained throughout the study. All the sources from which the information was borrowed have been acknowledged.

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