A Conceptual Model of Risk Management Maturity for Road Construction Project

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Abstract **- Under strategies of transforming connectivity India has second world largest road network. For socio and economic development it would be increased towards rural and urban area also. But at same time its important look towards construction sector as the increasing infrastructure development also increased with risks for road contractors and road Construction Company. So to minimize risk factor from projects there is lot of maturity models are developed from past decades but not with point of view of road construction project. This paper present advanced theoretical model that showing relationship of organization management and risk management process with the help of various literatures on the subject.**

Keywords- **Risk Management Maturity Model (RMMM), Organization Management (OM), Risk Management Process (RMP), Analytical Network Process (ANP) Model, Risk, Maturity.**

I. INTRODUCTION

India put its first big steps towards infrastructural development and connecting India with the idea of North-South and East-West corridors, linking the metro city (Delhi, Mumbai, Chennai, Kolkata) through high class highway [3]. As we know development of nation is indicated by its road structure development from Highway sector to the rural road sector. As per report by ministry of road transport Govt. of India as of January 2017 India had completed and placed in use over 25600 Kilometers of recently build 4 and 6-lane highway connecting many of its major manufacturing centers, commercial and cultural centers [2]. Also as per economic survey of Govt. of India road transportation in India carries 80% of the passenger traffic and 60% of the good traffic. Moreover the state and national highway which carry 70% of all passenger and freight traffic in India [1]. So it's clearly defined that road construction in India plays vital role in development of country, but from past decades road contractors and road construction company face more problem in their regular working life due to lack of management especially in risk management. To avoid such problem various tools are developed by various researchers and one of them is maturity model. From past decade's researcher get more interest in maturity model and its practices. As we know maturity model are not new concept but it's very helpful to managerial person to identify their current states in various departments in projects. As per study of various research paper and maturity models we could understand that there is lack in current maturity models which not fulfill need of current risk management practices in road projects. Therefore to fulfill the requirement of road construction industry we develop Risk Management Maturity Model (RMMM) as a tool to identify the parameters of maturity model. Also the paper attempts organization management and risk management process, Concept of maturity and risk. The current study focuses on the strength and weakness in risk management practices of road Constriction Company and contractor by studying various literatures. Also concept of maturity and various maturity model to prepare proposed maturity model.

II. LITERATURE REVIEW

A. Risk

Concept of risk is mainly popular in economics and then it has been successfully used in various other subjects such decision making in economics, finance, also decision science [5]. Risk has different meaning in different field prospective such finance, design and science, Engineering etc. Mainly risk always considered as negative, hazardous, harmful concept. But some of the guideline considers a risk is as positive point of view that is opportunity and it is taken as beneficial concept for achieving project objectives [6]. Risk is nothing but opportunity it has positive effect on project objectives [7]. Some of the researcher defines and distinction between risk and opportunity as follows.

- Risk is measurable uncertainty
- Uncertainty is immeasurable risk.

B. Risk Management Process (RMP)

Risk management is one of the nine most important parts a project manager has to undertaken in his role [7]. As we know risk management is very difficult task to fulfill the objective of project because functions are change as per the project life cycle change [9]. But with help of proper risk management one can improved chances of success in project also achieve project objective without obstruction. Unexpected surprises can be reduced. Increase precision in work which gives economical benefit [10]. In order to working with uncertainty and risk it is important to work with systematic approach [4]. Above statement define that Company / organization require

working with Risk Management Process (RMP). A common way to divide the process is into identification, assessment, response, monitoring and report. If the organization / company desires to be successful in their project work with risk management and also it is important to involve people that are working within the company [4]. It is profitable to manager or decision maker to use risk management at early stage of project where major decision has to be taken example- Selection contractors, choosing alignment, method and material to be used.

Table no. 1.

Risk management process (RMP) in construction organization.

Risk identification
Risk analysis or assessment
Risk response
Risk monitoring
Risk management reporting

C. Organization Management (OM)

Organization is nothing but group of people works together to achieve company / organization goal or objective. To achieve these goals organization create systematic hierarchy and inter relation with organization parts that can be described as organizational structure. This all parts are essential for proper working of organization [12]. Organization management related with various factor such as stakeholders, resources and also for proper Risk Management Company have its own defined risk culture. Above factors not only affect Organization Management but also on Risk Management Process.

The success of any project mostly depends upon availability and effective management of various resources such as money, material, equipments / machineries, human resources. Prior to starting of any project it is essential to manage arrangement of resources by organization / company [13]. A poor resource management cause's risk in construction project if all man, material, money, equipment etc. not used properly it may arises a great loss or complete failure of project [14].

Stakeholder management is one of the most essential parts of organization management. Who are stakeholders "Stakeholder are peoples or group of people who have the power to directly affect the organization's future" [15]. Due to poor stakeholder management many problem arises in construction project and it may affect on quality and quantity of project [16]. It is one of the challenges to project managers and decision maker to fulfill need of stakeholders involve them into decision making for success of project [17].

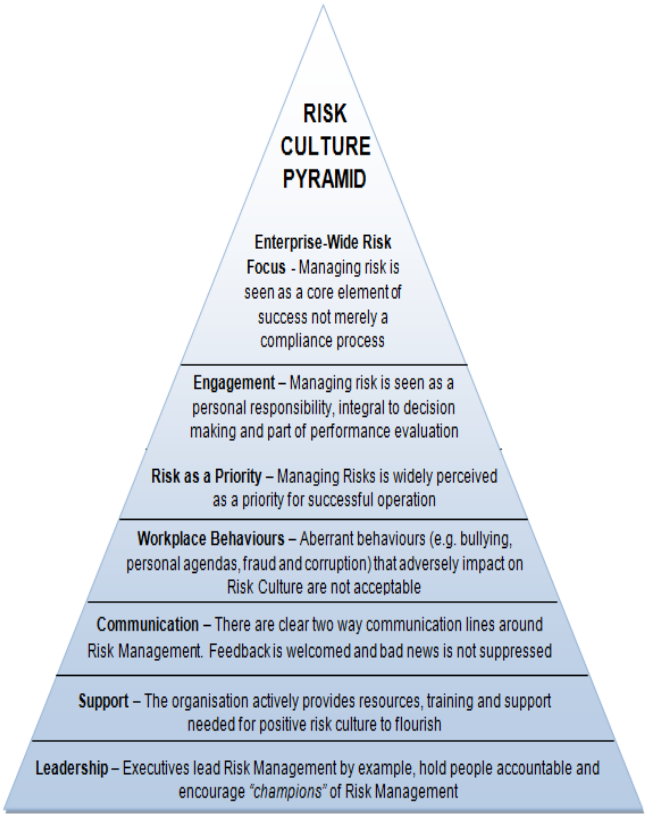

Fig 1 Risk Culture Pyramid

A risk culture plays an important role in influencing the actions and decision taken by decision makers within the organization and in shaping the organization attitude toward its internal and external stakeholders, including its management team. Today risk culture is an increasingly prominent part of project management for assessment of risk effectively. As we know human beings acting as individual and acting as groups are the wetware in the system not necessarily behaving in the logical, predictable and controllable way that we would like them to. Every individual brings to the job a unique perception of risk. Every group and organization has its own approach to risk, its risk culture [18-19]. This risk culture will influence the mechanisms and techniques that the organization employs to manage risk but is also in turn influenced by them. For improving the risk management company has to understand existing organization culture.

D. Maturity and Maturity Model

Maturity is defined by many researchers differently in closely related way. Some of this is presented here; Maturity means fully developed and perfect, in regular usage [20]. It is used as "Best Practice" benchmark for organization as self assessment scale [21]. Maturity concept is a logical map which shows how to improve organization service [22]. Need for maturity research is to set benchmark for Construction Company or organization to measure their current capability in various points of view such as evaluation, evolution also diagnosing

strength and weakness in process and practices. It helps manger where is to be need to improve the performance of management.

Maturity model is not new concept first maturity model was developed in 1987 by Software Engineering Institute (SEI) i.e Capability Maturity Model (CMM) which is base of the other maturity model later it was extended to use of other areas [23]. Project Management Maturity Model (PMMM) developed by Project Management Institute (PMI) which is solution for diagnosing the maturity of project management process [22]. Risk Maturity Model (RMM) is the first considerable attempts to develop a framework for a risk maturity model. Then there is further more research was done on maturity model as per need of construction industry. According literature current maturity model do not meet the requirement of road construction companies and road contractors because they do not consider nature of work, size of work and other factor such as resource management, stakeholder management, organization structure support, risk culture in organization within which how it interrelated with risk management process also there effect on each other and finally on maturity of road construction company/organization.

Table No.2

Proposed Risk Management Maturity Model (RMMM)

Key Area	Key Element	Initial Level	Defined Level	Managed Level	Continuous Improvement Level
Organization Management (OM)	Organization Structure Support.	-No Top management support. -One way communication only -Unawareness about risk management in project / company.	-Awareness about risk management but lack of top management supports to risk management in projects. -Two way communication as per need. -Risk priority basis structure support system is their (Priority only to large project).	-As the benefit of risk management Understood at company level although not always consistently achieved. -Two way communication for decision making purpose. - Involvement of all department heads and some time internal stakeholder (staff) for solving risk related problem.	-Effective strategic planning for risk management to achieving goal with effective software and updated data base. -Good Space for both way communication in decision making - Involvement of internal (staff) and external stakeholder solving risk related problem.
	Resource Management	- Do not consider as resource management is risk factor while planning and identifying process of risk management. -No any strategic planning for resource management in company / organization.	-Resource management is effectively considered as risk factor for risk management planning. - Poor management for resource planning. -Lack of proper documentation process.	-Proper scheduled management for planning and implementing resource management. -Use of related software for assigning and tracking resources. - Proper documentation process and use of related software.	-Preparing long term – short term planning for resource like (money, material, equipments, labour). -Scheduled planning and implementing with project stage basis. -Proper monitoring and controlling to avoid risk. - Audit of documentation and database is done periodically.
	Stakeholder Management	-Unawareness of stakeholder management in company / organization and their impact on project. -No any planning or strategy to deal with stakeholders and their expectation.	-Define awareness about stakeholder's importance in project. - Lack of policy to identification project stakeholder's -Lack of proper planning to deal with stakeholder's - Improper implementation of system.	-Proper policy to identify project stakeholders. - Well define strategy for managing each key stakeholder expectation and need. -Involving Stakeholder's while decision making process in projects. - Proper documentation process and database.	-Well define policy for identification of stakeholders in project. -Performing stakeholder analysis for a project (analyzing their interest, involvement, impact). -Two way communication with each stakeholder. -Standard documentation process analysis of report. -Periodic audit is done for proper stakeholder management.

	Risk Culture	-No any risk culture policy defines for company / organization. -Lack of knowledge about risk culture in top management and staff -No any risk related practices run in company (Knowledge sharing, training).	-Risk culture is considered in company / organization policy but unawareness in top management. -Lack of implementation of risk related practices (e.g: training program) due to poor management.	-Top management has proper knowledge and awareness about risk culture. -risk related practices properly run with strategic planning. - Staff engagement and motivational plans has run by company /organization.	-Standardize risk culture policy is define for all projects. -Benchmark is developed to assess past and current changes in risk culture in company. -Periodic risk culture audit is done for improve management policy. -Effective training program is run under external experts. - Reward system considered in program to encourage project team.
Risk Management Process (RMP)	Risk Identification / Identify	-No any awareness about risk management in top management. -No any format to deal with risk or uncertainty. -No any specific tool used for identification of risk in project. -Identification is at individual level	-Little bit awareness about risk management in higher authority but consider only large projects. -Basic level identification tools are used but only for large projects. -Input from key stakeholder is considered for risk identification purpose.	-Awareness about risk management in higher authority consider for most of projects. -Proper documentation process and standardized respective tools are used for identification of risk. -Integrated process and practices with stakeholders and resources.	-Full of awareness about risk management in whole company / organization. -An improved standardizes process for identification tools are used in each and every project.
	Risk Analysis / Assessment	-No any assessment process or format to dealing with identified risks. -Analysis of risk at individual level but no any standard format for assessment.	-Basic level format for analysis of identified risk. - Top of risks in selected and large projects is analyzed with help of external consultant. -Risks are prioritized based on singe factor.	-Standardized process used to analysis of identified risks. -Multiple criteria used to prioritized risks items. -Analyzed data preserve in proper documentation. -Software are used to analysis as per possible.	-Advanced standardize process used for analysis of identified data. -Analyzed data preserve in soft copy format used for future projects. -Risks in various parts of company / organization are also considered for analysis. -For effective analysis risk are evaluated sub-categories wise.
	Risk Response	-Risks are considered as they arise. -There is no any proper mitigation strategy. -No any contingency plan for future and present projects.	-Risk response plans for selected and large projects. -Improper gathering of strategies to deal with risk evens. -Contingency plan and risk mitigation strategies developed only for large and selected projects.	-Risk response plans for most of projects. -Proper documented process with integrated strategies planning. -Contingency and mitigation plan prepare for most of projects.	-Risk response plans are run on each and every project. -Well defined documentation process with advanced integrated strategies planning at all and every project of company.
	Risk Monitoring	-No any monitoring process and practices. -Monitoring of risk is on individual level. -No any documentation process.	-Basic format prepare for monitoring risk but lack in practices. -Monitoring and further process work for selected and large projects.	-Standardize and formal process for monitoring risk. -Practices run on most of projects with good planning. -Review period is determined by the operating environment.	-Milestone and benchmark for success and warning sign for failure are identified and stored (risk register and risk assessment sheet). -Periodic review is included at company environment. -Monitoring tool and techniques are improved as per type and size of project.
	Risk Report	-No any risk reporting process. -Reporting of risk is on oral basis. -Impact factor and level are not considered.	-Risk reporting is done but only large projects. -Reporting depend upon on risk level and impact factor. -For small scale projects oral basis reporting is there.	-Risk reporting is done on most of projects. -Impact factor and level of risk are considered for reporting as per size of project.	-Quick reporting process for sudden risk. -Time to time review by higher authority. -Important report is preserve for future project. Reporting framework establish by company /organization.

III Objective

Objective of this study are given below,

1) To study risk management, maturity and maturity model using literature review.
2) To decide suitable analytical approach to evaluate risk management practices in road construction project.
3) To develop risk management maturity model to evaluate risk management practices in road construction project.

IV Research Methodology

For achieving the objective of the study, methodology adopted for the study of Risk Management Maturity Model is as follows,

At first studied various literature reviews on risk management practices in road construction project to understand the current status road construction industry. Then studied a literature on maturity and maturity model also studied current risk maturity model their strength and weakness related practices in road construction project. After this systematic developed a Risk management Maturity Model (RMMM) particularly for road construction project. In order to justify the conceptual proposed model Risk Management Maturity Model it will be put into questionnaires to take survey of road construction companies and road contractors. Data will be collected. Weights of questionnaires will be finding by multi criteria decision making software known as Analytical Network Process (ANP); for that purpose suitable ANP model is created. Score of questionnaires will find out by using Cronbach Alpha validate this score by using SPSS (Version:19) software.

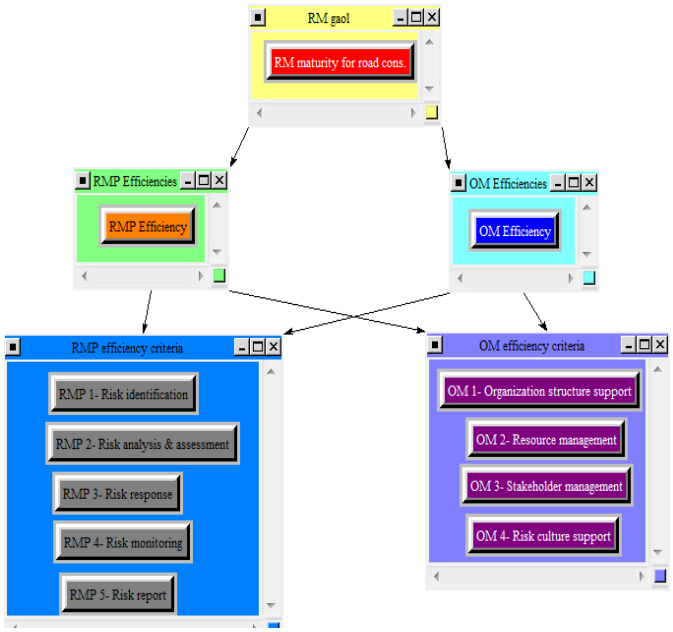

Fig 2 ANP Model for RMMM.

V Conclusion

The proposed RMMM has been developed based on the review of several studies including area of organization management, Risk management process and maturity of risk management practices in road construction project. The development of this model could help to decision makers / project manager in measuring the practices of learning in organization and studied the risk management maturity of contractors and Construction Company. The proposed model should be put into tests for reliability of model. Future quantitative study would help to test the whole RMMM and validate by the case study of road project.

This paper suggest the road construction company and road contractors that they could get benefit from implementing Risk Management Maturity Model and at same time it helps to learning practices towards continuous improvement risk management and risk management maturity of construction companies and contractors in India. The result of this improvement would be to overcome the problem related to Overall issue such as resource, stakeholders and cost of project.

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