

Risk Management in Construction Industry - A Case Study

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ABSTRACT: The Study investigated to acquire an overall idea about risk and its consequences in construction field and the process required for its management. The effect of risk on assessment of a project is discussed along with the tools and methods adopted to manage risk in construction industry. The objective of the research topic “Risk Management in Construction Industry” is to explore the effective way for implementation of risk management in construction industry, to consider the different types of risk management techniques applied to alleviate risk, to identify the use of implementation of the risk management, to determine the factors that can influence the applications of risk management in the project life cycle, wherein to categorize the principles adopted in Risk Management. I have conducted a survey on the following aspects of it, a) Identify, characterize, and assess threats involved in the construction industry b) Assess the vulnerability of critical assets to specific threats. c) Determine the risk (i.e. the expected consequences of specific types of attacks on specific assets). d) identifies ways to reduce those risks. e) Prioritize risk reduction measures based on a strategy.

KEYWORDS: Risk Management, Effect of Risk Management, Risk assessment, Risk allocation, Risk transfer, Risk mitigation.

I. INTRODUCTION

Risk management constitutes identification, assessment and setting preference for risk mitigation. This may include a synchronized and cost effective way of using the materials and resources in an order to minimize the hazards that may arise along with monitoring and controlling the unfortunate events that may occur. Risk can happen due to uncertainty in financial market, accidents, failures in the project, natural factors, legal issues, risk associated with credit etc. Different methods can be applied to manage risk which may range from transferring of the risk to subsequent party, avoiding the risk factor, minimizing the consequences of risk and accepting the effect of risk in few cases.

Project requires a special mission which is used by the client to get a viable edge in the market to operate. The past projects do not match the subsequent project due to its uniqueness which ultimately increases the chances of hazards. The characteristics of each project keeps on changing which make it difficult to be imitated. This requires unique skills to manage and accomplish the process.

In order to accomplish any project the project manager settles the complexities that may arise in the project which may arise due to hazards, uniqueness, need of the project and the environment in which it is executed. The objective of the investigation is to have a view of the risk management process from the perspective of different participants of the project. To meet them, required questionnaire was prepared appropriate to the research methodology. A survey was done which ranged from clients, experts, consultants to contractors. Among these participants a few were chosen who had experience in risk management projects in particular. Project managers and representatives of client signing the contract were also considered for the survey. Taking contractor side into consideration site mangers and estimators were also chosen for survey. Architects and design mangers were also respondent from the consultant’s side. The participants answered the questionnaire and were given opportunity to give their comments on it (shown in experimental results). Accordingly a case study was done for Case Study – British Airways Authority (BAA-Terminal 5)

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II. RELATED WORK

Risk management refers to the problems that may occur which are only in term of probability, at the same time in the actual time of occurrence there can be a no. of other events happening which are unknown. Things may differ from the prediction made. In such cases a series of events can occur due to one unforeseen hazard. At the same time its too difficult to coin what is hazard as it may vary from person to person. A small hazard may seem big for the other person. It depends on the exposure of the participant to such circumstances and its effect on developing perception towards it. This difference may be due to attitude, earlier experiences, different culture of work environment or knowledge of the person concerning that particular risk. Turner (1993) provides an encapsulating definition of a project as; “..An Endeavour in which human material and financial resources are organized in a novel way..” Projects unique character differentiates then from operation.

Project requires effort while operations can be repetitive in nature. Projects are different with new endeavor which may have lot of uncertainties. According to Edwards & Bowen (1999) lot of assumptions were made as the data is not sufficient to consider the task for proper construction management. Assumptions are made, as a matter of necessity, by construction management in situations where there is insufficient data or information to continue with a task. Adams (1995) states that the risk and uncertainty associated with a venture are managed by the implementation of a risk management process; the objective of which is to reduce risk.

In construction, risk usually refers to the factors that may hamper the objective of the project regarding time, cost and quality. Identification of the risk that can be faced is important for the contractor to get alert and prepare in advance for the uncertainties that arises. A lot of ways are there to identify the risk and predict. This includes economic risk, financial risk, legal risk, managerial risk, technical risk, political risk and environmental risk [Edwards PJ, Bowen PA, 199]. Identification of risk forms the first major part of risk analysis. There can be of inherent factors which can be identified in this phase of risk management. Without proper identification management of risk becomes very difficult. Without identification it is impossible to manage risk. Many uncertainties cause due to lack of proper identification. Risk factor needs a proper analysis. To avoid such factors the risk identification process should be implemented properly in a way which minimizes the probability of uncertainties. To achieve this questionnaire and interviews are done after a lot of brain storming process.

Research Questions are arrived to understand the uncertainties....

1. What is a hazard?
2. What is risk?
3. What is risk assessment?
4. Why is risk assessment important?
5. Whom do I involve in a risk assessment?
6. When do I need to do a risk assessment?
7. What do you mean by ‘good practice’ and how do I find it?
8. Is there a specific form/format that to use to record a risk assessment?
9. What is the precautionary principle?

Implementation of risk identification process should be done according to the demand of the situation in that particular case. We can even say that it requires a lot of time and constant effort to achieve even then one cannot deny the possibility of missing out any probable risk. It is hard to identify the entire risk factor one after the other. A general level risk which can be taken as common risk in all projects can be identified taking previous examples into consideration which can prove to be time saving as well as reference for the new project.

Attributes of Risk: In risk assessment it is crucial to identify the different attribute of risk, such as if it is specific in nature or general, dynamic or static, etc. This is due to the fact that risk allocation necessitates to understand the attributes of risks, thus to assign them to those who can treat them accordingly. According to the attributes the risk classification is done. Williams (1995) observed that it is primarily necessary to identify each risk as a foremost step in risk management and perhaps the most difficult one. There may be two sources in a construction project from where various risks are deduced. They may be external or internal risks. External risks comprises of environmental impacts.

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Internal risks comprises of the uncertainties which exists within the project. Some specific definition of risk is as follows:

Economic Risk: Economic risks are associated with supply of labor and materials, availability of equipments, price increment of the construction materials, various fiscal policies, exchange rates and inflation rates.

Financial Risk: Financial risks are associated with the cash flows, capital supply, interest rates, credit ratings, rentals, etc. Due to the involvement of various local partners, for example, customers, suppliers, contractors, etc, risk of local entities' reliability arises. The project's success rests on the reliability and creditworthiness of the local partners.

Legal Risk: These are associated with the contractual clauses, codes and regulations, issuing and approval of drawings are done by contractual grounds of building procurement.

Managerial Risk: Managerial risks are associated with the human resource management, productivity, cost and quality control. Safety risks, quality of work, faults, productiveness and competency are considered as the major risks in a construction project.

Technical Risk: Technical risks are associated with various technical factors related with the construction process, such as technology failure, design failure, equipment breakdown, error in estimation, health and safety aspects. Location of site, site accessibility, etc is some of the risks coming under this category. There may be differences in work procedures in cases of joint ventures, such as local-foreign joint ventures.

Political Risk : Political risks include interference of foreign government in the business activity, change in the law, etc. Public unrest, industrial relations activities affecting project progress, project approval delays are included in this category of risk.

Environmental risks: Environmental risks deals with the soil conditions, weather condition and environmental impact risks. The effect of the project on flora and fauna, geological aspects, people comes under environmental risk.

The main reason of risk management is to cut down the possible loses and to compound the possible gains. Practical goals are needed to make risk management operable for any company. For construction companies, risk management has a significant role in decision making process. Even because of risks and uncertainties, projects can undergo many harmful consequences. The performance, quality, productiveness and the budget of the project can be affected by risks. Though primarily it's not possible to eliminate the risks, they can be reduced, transferred or held back. Thus it can be said that the main reasons for which companies and organizations should adopt risk management are : loss minimization, to take hold of the opportunities, to cut down or limit uncertainty and for legal acceptance.

III. TYPICAL CONSTRUCTION RISKS

The risks that may have adverse effect on the project cost and time schedule can be divided as (i) site based risks, (ii) design/ construction related risk due to lack of coordination between team and the client, (iii) human resource and materials based risk, and (iv) few other external factors. A chronologically developed risk management is required for the good practice in the industry. The project aims and objectives varies from the client to the designers, contractor, investors, stakeholders, etc. if the relation and communication between the different parties is not proper that may result in risk. Different participants of the project don't share a formal way of approach to the risk as a team especially in case of owner and the contractor.

The parties involved in the project are often divide into phases which may develop gap between the parties in terms of communication and information flow may be hampered. If we take into consideration the usual owner-contractor relation then problems of dispute is sometimes very adverse. This may lead to non-cooperation between the project team and the management. Risk can occur anytime during the project life cycle. Problems should be analyzed taking into consideration specific approach of the party towards the risk but it should be dealt with respect to all other parties and their associated risks. For example operational management strategies to meet risk arising from it should also consider the effect of it on planning management.

Only some parties involved in the project do have proper knowledge of the risk. It requires strong organizational format to break the difference between owner and contractor in order to increase the efficiency and rate of production. All the parties associated with the project agreed on the point that a proper synchronized approach is required for assessment of the project. A well structured tool and process can help in risk management.

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Sensible risk management: Taking into consideration the research done and the point of view of many organizations and concern parties in construction we can formulate few sensible risk management principles.

Sensible risk management can be considered as:

- Ascertaining that the people in the work place are safe and don't have any hazard.
- It is beneficial to the society by creating a balance between profit and risks related to it. It's a relation between the highly hazardous and simply occurring risk factors.
- Ensuring creativity
- Enabling the understanding of likely hood to get robust action in case of failure to manage risk.
- Giving every individual a sense of responsibility that they have to undertake.

Sensible risk management does not include:

- Making the society totally devoid of risk
- Making heaps of paper assignments
- Making small risk exaggerated to horrify people
- Putting an end to the recreational activity and learning experiences
- Minimizing the vulnerability of protection against risk.

Risk management aims to minimize the harmful effects and sufferings of people.

- The procedure to asses risk
- Sensibly managing risk
- Making template for risk assessment
- Providing examples of risk assessment

Risk management includes risks that may happen in the work environment. It protects the most valuable assets of the project including the employees. A lot of people can be injured due to failure in risk management. Risk assessment is very crucial in protecting the workers and the business meeting the requirements of the legal issues. It helps to asses and finds the most important risk that can hamper the work culture. The factors which have potential harm the environment. According to the legal formalities one cannot make the project totally risk free but ensure that precautionary steps are taken to meet those. It expects the individuals to be reasonably practical. The following gives guidance of how to be reasonably practical in handling risk. Five steps to handle risk assessment principles:

Step 1: Identify the hazards

Step 2: take and decision regarding the individuals who may be harmed

Step 3: Assess the risks and settle on safety measures

Step 4: Document result and apply them

Step 5: Evaluation of risk assessment and revise if essential

IV. RISK MANAGEMENT IN THE PROJECT LIFE CYCLE

To understand the relationship between risk management and project phases for capital projects is difficult. In case of international projects, the project progress and the phasing decisions can be easily isolated from risk management. Various participants control the several phases of an international project. In most of the cases, owner is responsible for program analysis, to manage and control design and engineering a third party is hired, and to construct the project a contractor is hired, who in turn shows the results to the owner for production or operations.

Kim and Bajaj (2002), studied that in case of structuring projects, isolating the project participants increases the risk of minimal attention to the project. Individual project participants become concerned with only their own project risks and either willingly or unwillingly tries to transfer these risks to other project participants.

Chapman and Ward (2002), elucidated that in risk management lessening the impact plays a vital role. By implementing in a proper way, a good mitigation strategy will reduce adverse effects. There are four mitigation strategy categories which are used commonly are:

Avoidance : When a number of lower risk choices are available from various alternatives.

Retention/Acceptance: To accept the cost/loss a conscious decision is made in case of an event.

Control/Reduction: Continuous monitoring of the plan and amending it accordingly depending on the status of the project. This leads to a better development of the plan and follow up of the plan. This is the most common approach in devising a mitigation strategy.

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Transfer/Deflect: Risk is shared with others and different types of sharing include performance incentives, contractual shifting, warranties, bonds, insurance, etc.

There are four main phases in a construction process: programme, planning, procurement and production. Firstly, in the programme phase the client has an overview of the project and assesses the conditions for its execution. During the planning stage, architect shows construction drawings to the clients based on his needs. In the procurement phase the contract is signed by the parties. Finally, in the production phase the job is executed by the contractor.

As predicting all the risks in the project is impossible in the programme phase, the identified risk changes as the project is implemented. Hence, joint and consistent risk management is required throughout the phases of the project. Rahman and Kumaraswamy, 2004 and Motawa et al. (2006) devised a model, which can determine the potential changes which can occur depending on the available information present during the early stages of the project. Baccharini and Archer (2001) introduced a methodology for a risk rating process in the procurement phase, which allows the effective and efficient allocation of resources for project risk management. Lyons and Skitmore (2004) conducted a survey where one of the aspects was the use of risk management in each of the project phases. In the programme phase the risk assessment in the planning and production phases was higher. In the risk management process, risk assessment and risk identification was done often than risk response.

Harriss (1998) postulates that all our observations are interpreted using information and experience, and therefore the interpretations are subject to influence from theories.' The methodology involved is stated in fig.1 below

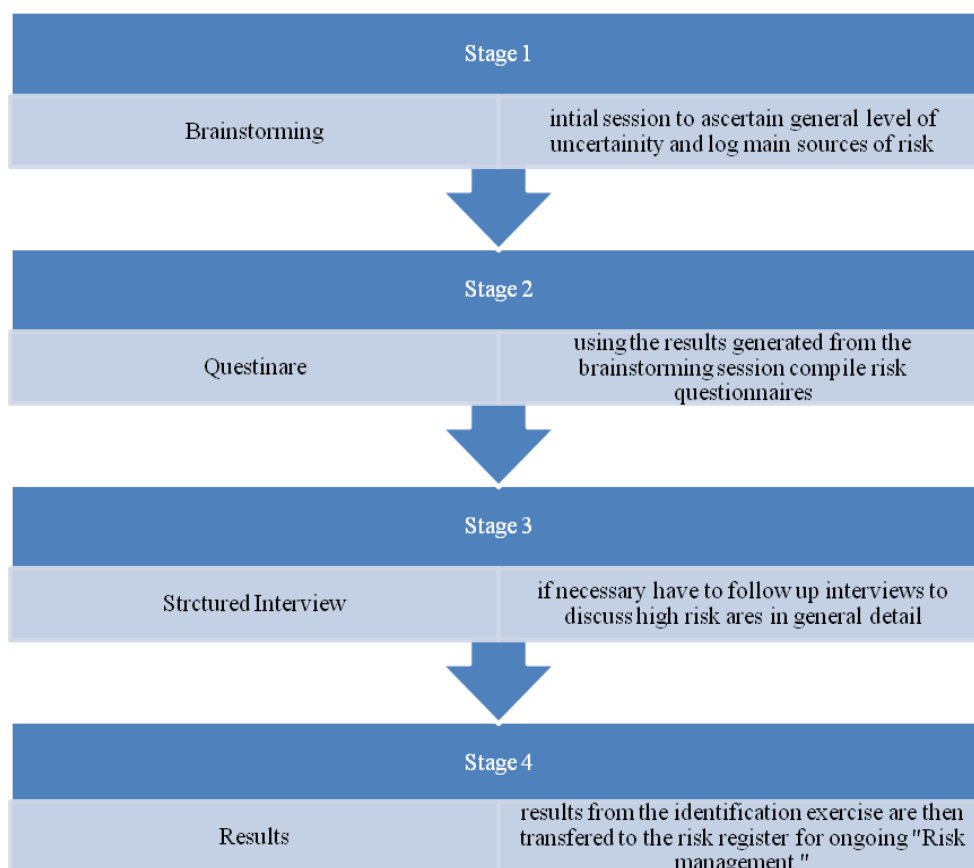


Fig 1: Data collection process

The methodology in (fig 1) that is applied to study perception of risk is different from that applied in project management. Risk factor and perception of risk are usually socially constructed. We cannot measure the amount of risk but can analyze it at the site of work. Mapping, measurement and implementation depend on the policy of organization. Hence a multi-exemplary advancement is required to proceed further in the research.

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V. CASE STUDY – BRITISH AIRWAYS AUTHORITY (BAA) - TERMINAL 5

Overview of the Project

BAA has adopted a partnering technique to its Terminal 5 construction project not only taking full responsibility of all the risks to the success of the project but also securing a commitment towards uninterrupted improvement from its partners.

The Challenges facing BAA:

1. Cost over-runs could have a damaging affect on BAA's reputation, cash flow, balance sheet, and even future survival, given the scale of the Project. Similarly, delays must be avoided as there is a trend in the increase in the passenger numbers. This makes the undertaken project very significant for the BAA.
2. The site access is limited to one main route only. Hence, early planning work inferred that the project would cost over £1 billion more than was affordable and would be delivered two years late if an out-of-the-box approach is not followed.
3. A high degree of evolution is expected during the project by the BAA.

BAA's response to the challenges: BAA's approach works on the principles of the Latham and Egan initiatives, but it surpasses any solution so far applied in the UK.

1. The risks are to be borne by the client.
2. The Partners are given more importance than the suppliers - BAA has developed an "Integrated Project Team Approach", so that the talented people involved with the project stay motivated and organized enough to get the maximum output from them.

Risk management

BAA believes that "project management is a tool of the risk management approach, not vice-versa". Risk control ratings are set in the overall programme. These ratings cascade through the project's management and transform into personal plans and objectives of all team members. The data in the system is supposed to be meaningful and purposeful. The "root cause" of each risk is identified by the risk process which enables the risk to be eradicated in the most effective way. BAA identifies four levels of risk control. The primary objective is to keep all risks between level 2 and 3 in the following scale:

1. The solution does not manage the risk at an acceptable level.
2. The risk is managed at an acceptable level with the possibility of improvement.
3. The solution reached is optimal and cannot be improved upon.
4. The solution excels the level of risk, and should be adjusted.
5. Early on, the most critical risks are identified and where suitable, the solutions are tested in beforehand to determine effectiveness of the solution.

An example of pre-emptive risk management

To understand the challenge in erecting a huge roof (that spreads across more than 150 meters), the designers, suppliers, fabricators and the T5 roof team pre-erected the roof abutment structure off-site in Yorkshire. The pilot pinpointed 140 significant lessons. Each had a risk mitigation plan enables in smoother workflow and faster construction on site.

Overall, this pre-emptive risk management technique was pivotal in saving atleast three months as studied by the project team. In this particular case, the time saved enabled the project team to cover-up for the delays that had previously arisen during the wet winter of 2001-02, which helped to keep the project on schedule.

Key Lessons

1. The risk is always borne by the client.
2. Project management is a tool for risk and opportunity management and not vice versa.
3. Those who are best able to manage the risk should be handed over the management activity, and take over forms of contract that supports a risk management approach.
4. All parties reap substantial benefits from collaborative, integrated working arrangement with suppliers.
5. Board level leadership and sponsorship is utmost important.
6. Safer construction and fewer defects can be attained by off-site prefabrication and assembly of elements.
7. Major projects should be done under excellent and highly experienced people. This minimizes confrontation and establishes trust and openness in working relationships.

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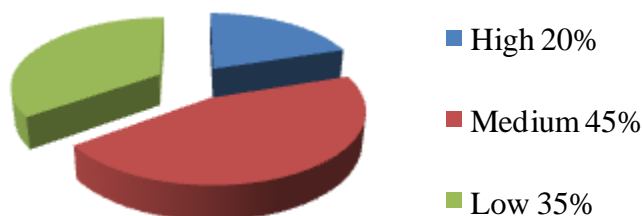
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VI. EXPERIMENTAL RESULTS

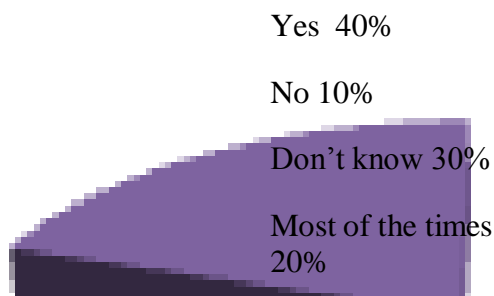
Q1. What are the field and scope of projects that you accomplish?



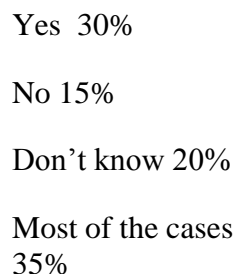
Q2. What is the likely hood and severity of risk in your company?



Q3. Did the employees receive a health and safety training?



Q4. Can the work carried out be proved safe?



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Q5. What is the scope of your company with regards to the type of projects carried on?



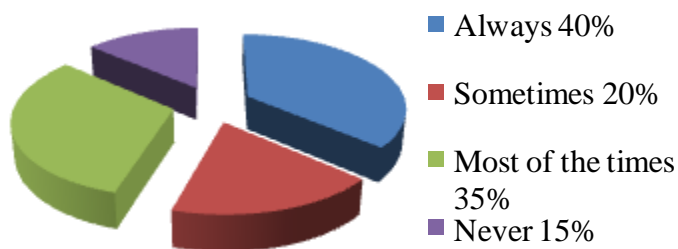
Q6. Is a risk assessment required in your company?

- Yes 40%
- No 10%
- Don't know 30%
- Most of the times 20%

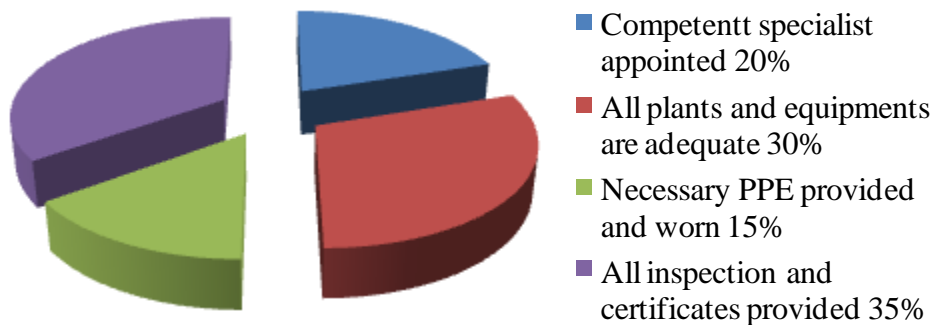
Q7. Do the tender documents contain the risk allocation clause?

- Yes 35%
- No 5%
- Don't know 20%
- Most of the times 40%

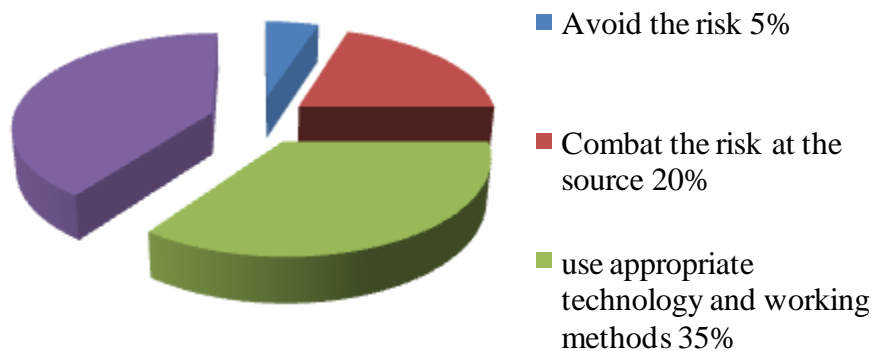
Q8. Do the team discuss about risk involved in the project?



Q9. Which type of action is taken to reduce risk?



Q10. What is the protective measure that you take?



VII. CONCLUSION

Looking at the effects of risk management on the goals of a project in terms of cost and quality, all phases of the project should undergo an open and conscious process. The overall conclusion is that, as per the project actors, risk management is strongly linked with the production phase. Majority of the risk processes are executed during this phase and the most active group being the contractors, have great influence on the risk management process. The owners and contractors pay little effort and time to assess and strategically plan for known, unknown or probable risks. If we don't have a proactive risk management process then problems that take place in a project could increase the delays and costs. Better project performance can be achieved by identifying, allocating and managing risks at the front end of the project planning process. Project risk assessment planning is a process which helps the participants to address the risks before they turn into bigger problems. While a project can be split up into different phases and so is the assessed risks and its management, managing risks as a continuum over the project life cycle is necessary. It requires initial recognition, integrated with a systematic method of monitoring changes and impacts over time for maximizing the process of project risk assessment and risk management.

Risk and their impacts tends to vary over the project life cycle while some risks remain constant and others go up or come down with the progress in the project. It is important to identify the risks occurring across the whole project life cycle and give due consideration which in turn could improve the performance of the project. It is also important to identify the optimal risk, the procedure of assessment and the timing along with identification and outlining of well-disposed decision points within the project life cycle. Some owners and contractors have developed a process for optimization of the portfolio of project risks throughout the project life cycle.

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