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GLOBAL PRACTICES IN CONSTRUCTION PROJECT RISK MANAGEMENT
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# Global Practices in Construction Project Risk Management

Ondiappan Arivazhagan,
CEO, International Institute of Project Management (IIPM)

The current state of risk management in many global projects is such that the probability of project failure could be forecast by project management experts / risk experts even before execution of the project starts. This article explains how to enhance the chances of successes by adopting certain generally accepted and good global practices in construction projects risk management aligned to ISO: 31000 and PMBOK® Guide for project management of the Project Management Institute, USA. This article is of significant importance in view of the fact that nearly 30% of the construction projects are considered failure even with so much of advancement in construction technology & equipment for the construction projects. This unusual percentage of failures, despite its maturity in project management compared to other nascent industries, indicates that some peculiar factors must be present in the way construction projects are managed globally.

According to a report of the Ministry of Statistics and Programme Implementation (MOSP), as on December 1, 2012, about 270 central-sector infrastructure projects are delayed and one of the causes for such delay (risks) was the failure of the state to acquire land in time and hand over site for construction.

Singur, Nandigram and Kalinganagar incidents are examples of large infrastructure projects that had to be abandoned and shifted to another state in the face of public opposition (Stakeholder intervention).

In view of such recurring incidents of failure in managing construction projects, this article attempts not only to highlight a few classical risk factors in large construction projects, but also provides possible contemporary solutions as to how to respond to such risks in order to enhance the success of projects by explaining a few generally accepted global practices in construction project risk management.

## The Top 5 Project Risks

Various literatures available on construction project failures and successes around the globe identify the following risks as the "classical risks" (more frequency of occurrence) and hence the article analyses and proposes possible solutions to top 5 risks in global construction projects management.

1. Poor Planning & Scheduling skills
2. Poor Communication skills
3. Poor Stakeholder management skills
4. Poor Risk management skills
5. Poor multi-culture management

Let us discusses each of these significant factors, (p-value $< 5\%$) in detail and propose possible solutions to manage these risks effectively.

## Poor Planning & Scheduling

Most Planners and Schedulers of the construction projects use critical path method (CPM) as the technique of their choice to find out the overall project completion time without knowing the shocking fact that the single-point deterministic project completion duration they find using the state of the art software (but age-old method !!!) gives a completion time that has only 50% chances of completion. This is because CPM uses single-point activity duration estimates that are usually the modal estimates (most likely values) of the distribution assumed and this modal value of activity durations are closer to the optimistic duration than to the pessimistic duration and has only $<50\%$ chances for the activity being completed within the estimate.

According to the Central Limit Theorem (CLT), the critical path duration of the project, whose activity durations were the modal values of the distributions assumed, will still have $<50\%$ chances of completion only, irrespective of the distribution

shape of the duration of these individual activities on the critical path. The central limit theorem says that if number of activities on the critical path is large-enough (which usually is the case in large global construction projects), the distribution of the mean of the means of these critical activity durations tend to approach a normal distribution. An empirical study by on about risk, in 1990, demonstrates that the beta distribution represents construction durations very well It is known that the project completion time is sum of the means of all critical activities on the critical path, and hence the project completion time obtained using CPM model tends to follow normal distribution, for which, it is a well known fact that the mean has only 50% probability of completion (success). This clearly indicates that most construction project schedules based on CPM techniques may start the project with a completion time, found by CPM, which has only 50% chances of success. This is clearly a situation where we plan to fail from the beginning.

The question now is, can we depend upon project schedules that have theoretically only 50% chances of completion even before the project execution starts. Unfortunately, many global construction project schedules are developed by the schedulers, approved by the consultants and finally owners baseline the approved schedules that carry project completion duration (P50) with the hope that the project will somehow be completed within the traditional CPM estimated duration but without knowing the fact that it is highly unlikely. When all the major stakeholders are (contractor, consultant, and owners) involved in the preparation & approval of such a poorly developed schedule, it is not fair to blame or make the contractor alone responsible for the project schedule overruns.

### Solution

One possible simple solution to overcome this classic risk could be to go in for 3-point, probabilistic duration estimates using PERT and / or using Monte Carlo simulation technique (explained in detail latter part of the article) depending on project complexity PERT method is likely to provide 3 probable project completion times ( optimistic finish date, most-likely finish date, and pessimistic finish date) from which the range of completion times could be found by subtracting the optimistic project completion time from the pessimistic project completion time. This range of project completion time will help immensely all the key project stakeholders in correctly deploying their resources to avoid future schedule overruns and by accepting upfront a more realistic project completion time within this range.

### Poor Communication skills

It may be noted that project managers typically spend 75% to 90% of their time on project communications. It may also be noted that in a multi-modal communication system where any project team member, including the project manager, can communicate to any other person in the project team, the total number of. Communication channels = n (n-1) / 2

For example, if a project manager has a small team of 10 members from across the globe, the no. of communication channels among them is 11(11-1) / 2 = 55, which is huge and thus paves for lots of communication related risks. If the team size becomes double, let us say, during execution time, then the no. of. Communication channels is not double but increases by nearly 400% (21(20)/2 = 210; 210/55 = 3.8 = appx. 4 times). Now, one can understand the impact of team sizes on global projects because of possibilities of several communication lapses that may lead to communication-related risks.

For example, a sample situational question related to project communication management, in a global construction project involving team members from multi-cultural background underlines the importance of proper understanding of the responsibilities of sender and receiver in project communication processes.

Question: In a basic communication process that involves a sender and receiver, which one of the following is, both the sender & receiver are responsible for:

A. The transmission of the message
B. Ensuring the information being communicated is clear and complete
C. Ensuring that the communication is correctly understood
D. Ensuring that the information is received in its entirety

Ans: C. ensuring that the communication is correctly understood

However, in some cultures, people believe that sender is not responsible for making sure that the information is understood correctly and they think it is entirely the responsibility of the receiver. These cultural differences should be unlearnt first in order to work effectively on global construction or IT projects.

### Solution

One possible solution to avoid these communication-related risks could be to have small team as much as practical and train all key staff from all the key stakeholders like sponsor, contractor, consultant, supplier, sub-contractors, owners, performing org, etc., on the importance of effective communication within them by developing a RACI chart.

In addition, a comprehensive communication management plan could be developed addressing, among other things, role & responsibilities ( for RACI chart), type and format of reports, level of detail needed, frequency of reports, key contact persons, escalation procedures, issue resolution time, preferred communication methods (Push or Pull or

interactive), tools etc for approval by key stakeholders before the start of the project.

### Poor Stakeholder Management skills

According to the PMBOK® Guide- 5th edition, project stakeholder is any individual or group, or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project. Stakeholders may be actively involved in the project or have interests that may be positively or negatively affected by the performance or completion of the project.

In the recent past many construction professionals and investors would have noticed scraping of several mega infrastructure projects, capital facility projects, power projects, highway projects due to strong resistance or protects (stakes) from the prospective stakeholders. Of late it has become a practice to announce mega projects with big fanfare only to scrap it within a few months of its launch. These reported incidents clearly indicate that during feasibility-study phase of such mega projects, the prospective project stakeholders' interests / concerns have not been considered nor have they been consulted before embarking on such projects.

The risk & uncertainty to project are highest during the start period and gets reduced progressively, if managed appropriately, as the project proceeds further ( Fig 2). The amount of money, time & energy wasted by all stakeholders (Government staff, promoters, villagers, land owners, public, NGOs etc.) is a huge waste and is beneficial to neither the nation nor the nationals. It is also painful to note that much bigger mega projects in countries like China are managed well even when protects from NGOs & directly affected parties are clear & present.

It's high time we learnt a few lessons from management of ultra-mega projects like the Three Gorges Dam (1997) in China. This project, now in operation, is touted to be the second largest man-made structure in the world and the first being the Great Wall of China. It may also be noted that nearly 1.2 million persons were affected by this new dam across the Yangtze River and construction of the dam has created a 450 km long manmade lake in the upstream side of the dam from the water impounded by the dam. To put the size of the artificial, navigable, fresh-water lake in the right perspective, the dam when completed , would create a water body which would extend back up to the temple city of Madurai, approximately 450 km away from Chennai. The readers can imagine the size of the lake, number of trees & families that might have been displaced. Despite all these disturbances, resistances, perceived environmental impacts etc, the Chinese govt. went ahead with the construction of dam.

A year ago, the dam construction, amidst all risks, was completed and commissioned to supply clean electricity. Incidentally, the Three Gorges Dam was started around the same period Kudankulam Nuclear Power Plant was (2002). In author's opinion, the success of Three Gorges Dam and the failure of Kudankulam project can both be attributed to proper (or improper) management of the project stakeholders. As projects are one of backbones of any economy / country / nation and project stakeholders are the beneficiaries of such projects, in one way or the other, it is the promoter's or sponsor's responsibilities to ensure that project stakeholders are identified well in advance and an effective stakeholder management plan developed with specific approaches to handle various class of stakeholders (like supporters, neutral, resistors, internal, external etc). A good starting point to classify stakeholders could be to make use of the popular Salience model.

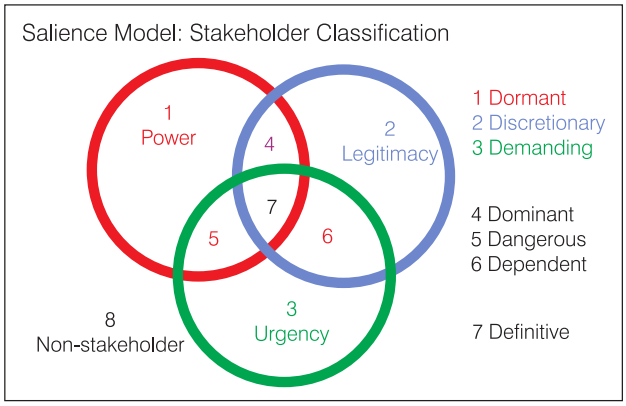



Figure No. 1

According to this model a person who holds neither power nor legitimacy nor urgency with respect to the project is the only person who can be considered a non- stakeholder. This indirectly means that, for any mega project, there will definitely be several hundreds of stakeholders, who many affect, may be affected by and/ or may perceive themselves to be affected by the outcome of the project.

It may not be out of place to mention here the LAAR Bill, concerning the land acquisitions / compensations, project-affected-people (PAP) etc, of 2012. While the objective of the proposed Bill is to balance social justice and the need for infrastructure development, it is more focused towards protecting the interests of the land owners which, in turn, is likely to pose more challenges (potential risks) for infrastructure projects in the future.

The LARR Bill requires the project owner/contractor to provide rehabilitation and resettlement package for the project affected people (PAP) in addition to the compensation to be paid to the land owners for acquisition. The definition of PAP is broad and it includes landowners, tenants, lessees and persons working in the affected area for three years prior to the acquisition, where the acquisition would affect their primary source of

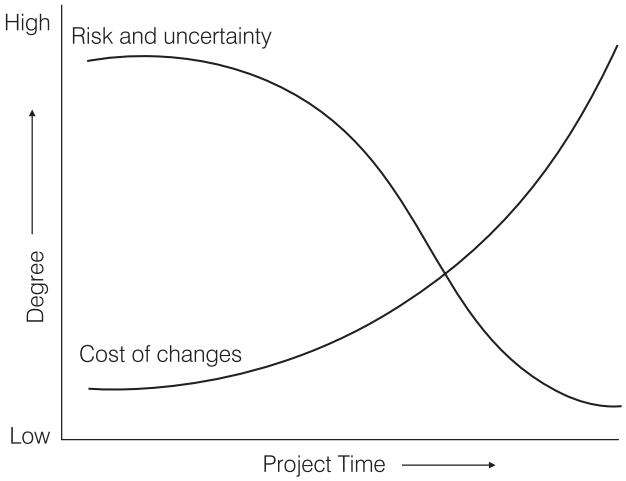



Figure No.2
(Source courtesy: Project Management Institute (PMI) - PMBOK® Guide)

livelihood. The proposed framework does not aid in reducing the time involved in completing acquisition of land required for a project. The LARR Bill requires the project owner/contractor to undertake a social impact assessment study which would, in turn, need evaluation and approval by a multi-disciplinary expert committee.

The LARR Bill does not set out any timelines within which approvals will be given (potential risks to the contractors). It is further significant to note that no proposal for land acquisition would be approved unless 80 per cent of the PAP consents to the rehabilitation and resettlement package proposed by the Govt. or project promoters.

### Poor Risk Management skills:

According to the PMBOK® Guide, Project Risk Management includes the processes concerned with conducting risk management planning, identification, analysis, response planning and controlling risk throughout the project. It includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to project objectives.

Project risk is an uncertain event or condition that, if it occurs, has a positive or a negative effect on at least one project objective such as schedule, cost, scope or quality.

ISO 31000, although not specific to any industry or sector, says "All activities of an organization involve risk". This International standard recommends that organization develop, implement and continuously improve a frame work whose purpose is to integrate the process for managing risk into organization overall governance, strategy and planning, management, reporting process, policies, values & culture.

ISO31000 calls risk as "effect of uncertainty on objectives", "an effect is deviation from the expected – positive and / or negative" and risk is often expressed in terms "a combination of the consequences of an event and the associated likelihood of occurrence"

Risk Impact assessment investigates the potential effect on a project objective such as time, cost, scope or quality including both negative effects for threats and positive effects for opportunities.

Probability and Impacts are assessed for each identified risk. Risks can be assessed in interviews or meetings with risk experts. Risk probabilities and impacts are rated according to the definitions given in the risk management plan. Risks with low ratings of probability and impact will be included in the watch list. PI matrix specifies a combination of probability and impact that leads to rating the risks as low, moderate or high priority.

Probability and Impact matrix

| Risk Score for Specific Risk | | | | | |
|---|---|---|---|---|---|
| Probability | Risk Score = P*I | | | | |
| 0.9 | 0.05 | | | | |
| 0.7 | 0.04 | | | | |
| 0.5 | 0.03 | | | | |
| 0.3 | 0.02 | | | | |
| 0.1 | 0.01 | | | | |
| | 0.05/ Very Low | 0.10/ Low | 0.20/ Moderate | 0.40/ High | 0.80/ Very High |

Impact on an objective (e.g., cost, time or scope)

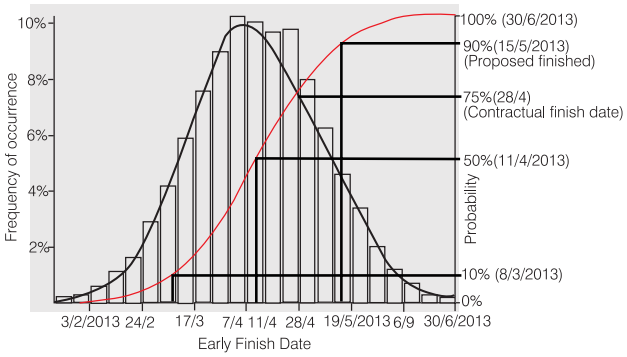
Each risk is rated on its probability of occurring and impact if it occurs.
The organization's thresholds for low (Green), moderate (Yellow) or high risks (Red)

Figure No.3 (Source courtesy: Project Management Institute (PMI) - PMBOK® Guide)

The organization should determine which combinations of probability and impact result in a classification of high risk (red zone), moderate risk (yellow zone) and low risk (green zone).

Probability-Impact (P-I) matrix illustrates the simple multiplication of the scale values assigned to estimates of probability and impact, a common way to combine these two dimensions, to determine whether a risk is considered low, moderate, or high.

Monte Carlo Analysis output - S-Curve for Project Early Finish Date




(Mean =11/4/2013, SD=26 days)
Contiingency Reserve: 21 days (19/5-28/4)
Figure No.4

| S.No | Risk Name | P | I | P*I | Priority (H/M/I.) | Potential Response | Risk Owner | CR |
|---|---|---|---|---|---|---|---|---|
| 1 | Total project cost | 0.7 | 0.4 | 0.28 | High | Mitigate | John | ? |
| 2 | Project finish date | 0.8 | 0.5 | 0.4 | High | Mitigate | Sunder | 21 days |
| 3 | Site handover | 0.2 | 0.2 | 0.04 | Low | Transfer | Suresh | ? |
| 4 | Rock encounter | 0.4 | 0.3 | 0.12 | Medium | Accept | Mohammed | ? |
| 5 | Exchange rate | 0.6 | 0.3 | 0.19 | Medium | Transfer | Sridhar | ? |

Table No. 1

Risk rating helps guide appropriate risk responses. Threats in high-risk zone and opportunities in high-risk zone should be targeted first. Opportunities in the high score zone can be obtained most easily and offer greatest benefit.

A risk register should be developed first by identifying risk through by using any or combination of techniques like Brainstroming, Delphi technique, Interviewing, Reviewing documents, SWOT etc. A sample risk register is shown in Table No-1. In this table the Contingency Reserve of 21 days needed for the project finish date as per the Monte Carlo simulation Analysis ( Fig 4) is also updated.

Cost and schedule contingency reserves, thus calculated using advanced simulation models, helps in updating the customer and other key stakeholders with more accurate project finish dates / budgets to enhance the key stakeholder stastification.

### Poor Culture Management

In light of globalization, understanding the impact of culture influences is critical in projects involving diverse organizations and location around the world. Culture becomes a critical factor in defining project success, and multi-culture competence becomes critical for the project manager. Culture represents the distinctive way in which a group of people related by geography, religion, ethnicity, or some other unifying principle, lead their lives.

### Key Characteristics of Culture

1. Groups, organizations and societies share cultures.
2. Culture is acquired by learning and experience.
3. Culture has a pattern characterized by its structure and integration.
4. Culture is transferred from generation to generation.
5. Culture is variable. groups, organizations and societies may change according to changes in their environments.

Today project managers operate in a global environment and many projects exist in an environment of cultural diversity.
By understanding and capitalizing on cultural differences, the project management team is more likely to create an environment of mutual trust and a win-win atmosphere.

An effective way to manage risks due to this cultural diversity is through getting to know the various team members, train on cultural adjustments needed in foreign soils, and the use of good communication planning as part of the overall project plan. Culture at a behavioral level includes those behaviors and expectations that occur independently of geography. Culture can impact the speed of working, the decision-making process, and the impulse to act without appropriate planning. This may lead to conflict and stress in some organizations, thereby affecting the performance of project managers and project teams.

Project managers must be on alert to learn from people of diverse cultures. Project managers in multicultural projects must try to learn relevant customs, courtesies and business protocols before taking on the responsibility of managing an international project.

It is learnt that out of Hofstede's six dimensions of cultural differences, three dimensions—power distance, uncertainty avoidance and long-term versus short-term orientation—affect most one's thinking about organizations. The remaining two dimensions—individualism/collectivism and masculinity/femininity—help us understand the people in an organization rather than the organization itself; whereas the last dimension—attitude toward life—relates to the value system of people in different cultures.

Project managers must be aware of cross cultural implications, value systems and dimensions of national culture to better understand the expectations of a diverse mix of project participants organized in a global team to attain project goals. They must learn to foster cultural synergy within their multi-cultural global project team.

### Risk Management & Big Data: New directions

Modern risk management cannot be effective without the application of Big Data sciences. More and more risk management professionals are embracing Data Analytics and base their decisions on the analysis of voluminous data generated within the company, rather than the traditional intuition-based decisions that could be biased.

Performance-based risks, Return on Marketing Investment (ROMI) risks, bidding risks, currency exchange risks, overseas

procurement risks, and attrition risks are some of the major risks global construction companies can look into to avoid or mitigate these risks appropriately by embracing Big Data / Data Analytics techniques. A good starting point towards implementing the Modern Project Risk Management objective could be to take the first baby-step by imbibing the culture of statistics-oriented Lean Six Sigma thinking across the company.

## Conclusion

From the above discussions and a sample of risks analyzed, it may be noted that project managers and/ or senior managers should not be contended with just identifying the main and obvious risks alone. Instead, they should strive to identify at least 100-150 risks in a global construction project by looking at what lies beneath the tip of the iceberg, involving key stakeholders and utilizing the various risk identification tools & techniques explained in this article. Risk management becomes easier if risks are identified and discussed more often and risk & reserve analysis should be an item in the agenda in all periodic project performance review meetings.

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**Author's Bio**

Mr. O. Arivazhagan is a PMP®, PMI-SP, PMI-RMP, Master Black Belt in Lean Six Sigma and a Honors Graduate in Civil Engg. with 30 years of Global Project Management experience. He has Managed, Estimated, Designed, Planned, Tendered & Executed large EPC projects in various capacities worth more than US$ 100 millions in countries including India, Saudi Arabia, Oman, USA and UAE. He has published many articles on various topics Project Management and Lean Six Sigma. He can be reached at askari@iipm-chennai.com