

DECISION SCIENCES INSTITUTE
Managing Risk in Indian Projects

Chakradhar Iyyunni
L&T Institute of Project Management
Email: ciyyunni@Intipm.org

Vittal Anantatmulaa
Western Carolina University
Email: vittal@email.wcu.edu

Sunil Kumar
L&T Institute of Project Management
Email: skumar@Intipm.org

ABSTRACT

Indian mega-projects also have many of the features highlighted by Flyvbjerg et al.. Indian project managers almost exhibit the same characteristics discussed by Kahneman et al.. In this paper, we explore the peculiarities of risk behavior in Indian projects via four case study experiments. We discuss stakeholder behavior at many levels – individual, inter-personal, team, organization and societal level and identify pathologies and suggest methods to alleviate these risky pathologies. In the ensuing discussion of work of a multitude of researchers, we derive a “hope model” for risk attitude which is stemming a virtuous cycle of many factors.

KEYWORDS: Risk, Projects, Hope, Social Science, Stakeholder management

INTRODUCTION

Contextual basis for evaluating Indian Project Performance could be discussed as a series of evolving uncertainties clouding project execution. Poor valuation of projects, poor financing, poor governance schemes and finally, mis-managed project executions can plague a project. In the book, *An Uncertain Glory*, (Sen & Dreze, 2013) portray an economic, social and political scenario to understand India’s checkered development story.

The author contends that by managing risk in infrastructure development projects, the uncertainty can be removed. Mahatma Gandhi’s famous saying, “(bridging) the difference between what we do and what we are capable of doing would suffice to solve most of the world’s problems”. That bridge is a risk management framework that incorporates appropriate risk behavior (risk-neutrality as opposed to risk averseness or risk addicted behavior) and preventive counter-measures to anchoring bias.

These authors (Flyvbjerg et al., 2003; Samset et al., 2006; Miller et al., 2001, 2005, 2008; Kahneman et al., 1979, 1993; Tversky et al., 1986) have discussed mega-project issues and management of risks and decisions in the global context. In the Indian context, organizations exhibit varying risk appetites when they bid for new projects based on their current performance on their project portfolios.

Also, in the guise of partnering, trouble looms in the form of: unnecessarily close relationships between customer and sub-contractor, incomplete project accounting of scope changes and ignoring variances on contractual clauses. When balanced-matrix or strong-matrix organizations do not give the Risk Management department a strong role then the management of risks is not a primary, important or powerful function thereby creating problems in projects. Alternately, constituting project teams which are not fully independent can also cause project failure because the risks are not fully comprehended.

Indian authors (Jha & Iyer, 2007; Bhattacharya et al., 2013), discuss measures for people processes in projects so that project performance can be managed. Appropriate measure of risk-based communication is the norm so that relevant stakeholders can step-in and manage the risks by appropriate decision making. In our experiments of risk attitudes assessment on a variety of risks through-out the project life-cycle, we claim that mal-adaptive risk behaviors can be controlled if competent personnel manage the risks. We, sometimes, do not succeed because we expect failure stemming from anchoring bias.

We demonstrate that with an inclusionary model of team management and evaluate a range of possibilities that may exist, we could possibly, hope. While the management of Indian project will require multi-level interventions with strong project governance and project leadership that has been demonstrated in the construction of the phase-1 of Delhi International Airport project and Delhi Metro project.

We tackle a tough problem of changing risk scenario arising out of multiple environmental conditions. We assess impact, showing hope, by studying cascading and compounding mechanisms of risk. Using quantitative risk analysis, Monte Carlo analysis or combination techniques (Iyyunni, April 21, 2016) along with analytical hierarchy process (AHP), we integrate ways to deal with barriers stemming from poor forecasting to poor decision making.

What ails the Indian construction industry? There is a general pessimism about public infrastructure projects in India. The reasons not all Indian, many/the same factors influence infrastructure industry throughout the world (Miller & Lessard, 2001) and is also related to social (Priemus et al., 2008) and industrial psychological factors – including, managing stakeholder engagement (Alladi & Iyyunni, 2015) in the agreed upon best interests of each stakeholder (social factor) and risk appetite (social and psychological factors such as perception and observation of environmental risks, anchoring bias and a lack of reward which leads to risk aversion).

We are interested in the question, no matter what the conditions of risk or uncertainty exist, how do we successfully complete large, complex projects with multiple stakeholders?

Galileo said “Measure what is measurable, make measurable what is not.” Hence we re-cast the question to a simpler version, “how do we create a favorable environment for success, in the context of complex projects?” For example, the right environment for making good decisions, and for creating a empowered, pro-active and competent work-force who can rise up to any challenge.

Contextual basis for evaluating Indian Project Performance is discussed as a series of evolving uncertainties clouding project execution. We do not succeed because we expect failure. We demonstrate, if we allow ourselves, that a range of possibilities exist, hence, *Hope*. Hope (Banerjee & Duflo, 2011; Duflo 2012) in a virtuous cycle (as opposed to a vicious cycle of

pessimism) will lead to better decision making via building confidence which in turn inspires trust and accountability (Sisodia & Mackay, 2013).

LITERATURE REVIEW

In reviewing the evolution of Delhi Metro project (Dayal, 2012), it is evident that there were many failures (such as equipment collapse, death etc.) but there were few (none) bad decisions or rarely a win-lose or lose-lose agreement between stakeholders. Mahatma Gandhi said “The difference between what we do and what we are capable of doing would suffice to solve most of the world’s problems.” This difference, we claim is risk management and good decision making under dynamic conditions. Using quantitative risk analysis, we integrate ways to deal with barriers stemming from poor forecasting (Sen & Dreze, 2013) to poor decision making (Flyvbjerg et al., 2003).

We assess risk impact or consequence squarely and deal with it, demonstrating Hope, with the help of case studies involving cascading and compounding mechanisms of risk.

Industry environment

Indian infrastructure projects are clouded with evolving uncertainties impacting project execution such as Project financing, Owner commitment, Contractual environment etc. Also, project manager familiarization to structured decision making is low as is the use of decision-making tools resulting in either over-optimism (stemming from an under-estimation of risks or anchoring of past experience) or non-understanding of project manager bias leading to risk averseness. The “brick-kiln laborer” (unskilled laborer) continues to “lack the basic requirements of dignified living” (Kumar, 2016).

The VUC(C)A environment - Volatility, Uncertainty, Complexity, (Corrupt), Ambiguity is endemic to all sectors of the economy. While the IT industry is able to cope with similar circumstances of project needs and economic environment. The IT industry uses agile life-cycle models to endure fast paced delivery, evolving/use of proprietary technologies and vagaries of customer industry’s business life-cycles.

The construction industry is not in a much different situation. The Indian construction company seems to be in a downturn/depressed phase of fewer large projects, which can claim national pride and international recognition. We advocate a method to characterize complexity in (Sanyal & Iyyunni, 2014; Remington, 2012, Shenhar, 2007), using industry and project-team *specific characterization* for novelty, technology, complexity and pace. Project success depends on project type and complexity, site conditions, owner’s disposition, and gross environmental condition.

The *Achilles’s heel*, we feel, is the unwarranted use of a huge number of human resources. During project execution wherein there would be a *large number* of micro-decisions made by a personnel who are not trained, disempowered and lack team work.

Risk and Governance

London Stock Exchange and RSM Robson Rhodes LLP noted in a 2004 report that “profits are the reward for successful risk-taking in a modern competitive economy. Companies that are

overly cautious will miss opportunities and are unlikely to succeed in the longer run. Even more certain failure awaits those who take risks recklessly.”

The board, senior management and the project sponsor should all ensure project risks are managed effectively. These stakeholders have a proactive role to recognize that risks are dynamic (Miller & Lessard, 2001, 2005, 2008; Flyvbjerg et al., 2003, Priemus et al., 2008; Rolstadas, 2011).

Over the last three decades, risk management has evolved from the management of known-unknowns or execution risks to management of uncertainties to, recently, management of unknown-unknown factors such as political risks, social risks, economic risks, technological risks, legal risks and environmental risks (Chapman & Ward, 2011). Risk evaluations range from labor productivity, cost of materials and equipment, capital costs, and economic conditions.

The Australian Securities Exchange (ASX Corporate Governance Council 2006) has also included operational, compliance and strategic external risks. More importantly, risks can impact reputation and brand of a company and investor sentiment. In Russia, FERMA 2003, organizational risk also (including those outlined by ASX 2006 above) spans market risk including critical success factors and an understanding of threats and opportunities towards organizational objectives.

Risk Management

Broadly, risks can be grouped into two general categories of risk factors. Internal project risk factors include:

1. delivery/operational risks,
2. technological risks,
3. financial risks, and
4. procurement/contractual risks.

While external project risk factors include:

1. political risks,
2. environmental risks,
3. social/cultural risks, and
4. economic risks.

The organization’s senior stakeholders should have a clarity that the risk profile is adequate, accurate, and defensible, and then focus on risk management from pre-bid to execution. A traditional risk management program (Chapman & Ward, 2011) includes identification, quantification (probability of occurrence and level of impact i.e., time and/or money or attributes such as safety), treating (risk response plans), and monitoring and controlling (anticipate if and when a particular risk element is active and apply a planned control action) and in the context of governance –reporting (about effectiveness in managing risk).

Challenges to Effective Risk Management:

Flyvbjerg et al., 2003; Priemus et al, 2008 outline the following challenges. They claim successful management of risk is tough – it is also an “involved and continuously evolving process because each day, every decision made by management eliminates some risk elements while at the same time introducing new risk elements into the megaproject’s environment”. Also, the environment changes dynamically, introducing additional difficulties.

PMI's Body of Knowledge advocates a structured and continuous process for managing risk. Generally speaking, managing risk (Chapman & Ward, 2011) "involves repeatedly implementing and completing a series of steps taken in a sequential order over the entire life of the megaproject". Also effective implementation of domain-specific activities such as concreting, equipment erection or commissioning activities is important. This risk-based activity is managing the technical risk of construction activity (with respect to scope, quality etc.). Besides, such risk-based activity management must be integrated to create a risk-culture of the organization by (1) translating project strategy into tactical / operational objectives and (2) assigning as job responsibility to each manager and employee for management of risk. Such a measure will support accountability, performance measurement and reward, thus promoting operational efficiency at all levels.

Managing internal elements should be easy for organizations as they are knowledgeable about it. It remains to align the risk framework, process, culture and management to organizational attributes by mandating linking of:

1. organizational values to managing risk,
2. organization's "appetite for risk",
3. organizational structure/culture supports de-centralized control or distributed decision-making, and
4. data and information availability to support risk management activities.

For managing external elements, managing stakeholder engagement throughout the life-cycle of the project becomes important.

Stakeholders now include anybody or anything (environment, technology) that may be affected by the execution or existence of a megaproject. For example,

1. non-financial stakeholders including the local community in the area where the megaproject will be constructed have to be satisfied,
2. working with affected parties for moving utilities,
3. environment that might be affected during, and
4. the local/state/central governments that must approve the megaproject.

Ultimately, a risk management program is only effective if it meets the needs of both the megaproject and all its stakeholders.

Social Risks

Management of social and political risks are indeed very difficult. Zurich Insurance Group's Corporate Responsibility Manager Karin Reiter (MIT Sloan Management Review brief, September 2016) states "protecting your company can't be achieved by insulating your operations from its interdependencies with society. Instead, business resilience requires embracing these dependencies".

From a systemic perspective, (Japp & Kusche, 2008) discuss the modernity, material and social-conflict dimensions of social risks. Contractual, Legal, Regulatory or Policy are not effective methods in managing social risks *during execution*. The mitigation of different types of social risks is suggested below.

1. Modernity or time dimension to be managed by creation of "anchors of communicative integration" i.e., people of diverse functions are in a state of continuous decision making/

choice-making. There should be a (structural) shift in societal communication toward a focus on decisions (make time visible; past is history of data before decision; future is the consequence of decision) and their consequence (forms the fundamental basis for a concept of risk in the context of a theory of modern society).

2. Material dimension to be managed by transmuted risks. The political system promotes worries and expectations (such as re-election). Literature suggests that “regulatory/organizations” try to shift the (social) risk from political/economic to other risk types.
3. Social-conflict dimension to be managed by appreciative inquiry.
 - a. Referring to Enzensberger’s thesis that in a society emphasizing responsibility for one’s own actions without social recognition could lead to violent discharge
 - b. Inability to identify any common ground and communication aimed at consensus is bound to fail; only a pragmatic assumption of difference can provide the basis for discourse. Pragmatism means here abstaining from any attempt at “real” or “authentic” understanding! But, there is an acknowledgement of differences.

Power in Projects and managing social risks

Flyvbjerg (Flyvbjerg et al., 2003, Priemus et al., 2008;) argues that social science should be recast as Aristotle’s practical wisdom along with Foucault’s understanding of power. The reinvigorated understanding of social phenomena by emphasizing contexts, interpretations and an in-depth understanding of existing power relations.

MODELS OF DECISION MAKING

Next level of deepening the question: Why do we make poor decisions?

We deep-dive into the reasons for poor decision making i.e., models, fallacies, assumptions and challenges (Tversky & Kahneman, 1986; Kahneman & Lovallo, 1993; Lovallo & Kahneman, 2003) and assess them in the Indian context.

Models

The rational model for a decision maker states that

- business decisions as choices among gambles with financial outcomes,
- assumes managers judgments of the odds are bayesian (choices maximize expected utility), and
- uncontrollable risks are acknowledged and accepted as they are compensated by chances of gain.

March et al. (March & Shapira, 1987) discuss a model wherein they state that managers reject the rational model in the interpretation of their role. They prefer the view that – “risk” as a challenge to be overcome by the exercise of skill, “choice” as a commitment to the goal and do not deny the possibility of “failure”.

Borrowing from the social science view of creating metaphors as ways to understand phenomena – “gambling” has been described as an apt metaphor for risk in decision making with the view that consequences are uncertain(!) and each option is actually a probability

distribution over outcomes. This is a perfect justification for the use of *Monte Carlo simulation* (@Risk, 2015; Iyyunni, February 2013; Iyyunni 19 April 2016) 27, 35, 36]

But, decision makers are NOT “Bayesian forecasters” or “optimal gamblers”. Decision makers are subject to conflicting biases of *unjustified* optimism and *unreasonable* risk aversion. Managing the balance between these two isolation errors affects the risk-taking propensities of individuals and organizations.

Fallacies, Assumptions and Challenges

March et al. (March & Shapira, 1987) discuss fallacies, assumptions and challenges faced by project managers.

The following are fallacies espoused by project managers:

1. decision makers have a strong tendency that their problems are unique,
2. they isolate current choice from future opportunities, and
3. neglect statistics of the past projects in evaluating current plans.

The following assumptions are made about the project managers as decision makers:

1. Self-image: project managers idealized self-image is NOT a gambler BUT a prudent and determined agent, who is in control of BOTH people and events. (Though the reality is that project managers are NOT in control of either people or events!)
2. Cognition analysis: project managers accept “choice as a gamble” as a model for decision-making but not as the rationality for the decision.
3. Project managers do not take large enough criteria set for assessing alternatives thereby tilting toward poor decisions.
4. Also there is an assumption of infinite rationality i.e., project managers are not aware of the concepts of requisite holism or bounded rationality which could allow for realistic assessments.

The main challenges in decision making are:

1. Overly cautious attitudes caused by a fear of taking / managing risks. These attitudes result from a failure to appreciate the effects of statistical aggregation while mitigating relative risk(!).
2. Overly optimistic forecasts result from the adoption of an inside view of the problem, which anchors predictions on plans and scenarios referred to as anchoring bias.

A typical situation of an anchoring bias works against a risk coordinator/manager is his supervisor telling him/her – that, “if the situation has happened before, why should we allow it happen now OR if it is not happened in the past, why do you think it will happen now?”

In case study 3, we explain (following Kahneman & Lovallo, 1993) that a conflict between risk aversion and anchoring bias can cause timid choices. Essentially, risk aversion stemming from narrow decision frames and the price of social isolation. Bold forecasts are caused by lack of both inside and outside perspective and un-necessary organizational optimism.

"Managers accept risks, in part, because they do not expect that they will have to bear the consequences (somebody else will!)" (March & Shapira, 1987).

Hope as a Capability in Managing Projects

We translate Duflo's work on "Hope as a Capability" and apply it to decision making in projects. The following is a summary of Duflo's work (Banerjee & Duflo, 2011; Duflo, 2012).

Here we explore whether there is a possibility of a hope-based mitigation for a decision trap?

Does hope function as a capability i.e., do people who are in un-empowered, in contexts or scenarios devoid of hope make bad decisions (in a self-fulfilling manner)?

The following are sub-phenomena that can be expected:

1. (hope-deficit) Duflo is of the opinion that "Hope" intrinsically allows people to realize their potential and that anticipation of a non-rewarding, bleak future can worsen their rational capacity. It is rational not to be over-invested in a business or decision. Also, irrational entrepreneurs exhibit optimism bias (Kahneman & Lovallo, 1993).
2. (vicious circle of negative shocks) External negative shocks, outside the control of an individual, can cause stress leading to a pessimistic explanatory style (Seligman, 2006). This pessimistic explanatory style tends to promote passivity and lower resilience that leads to the inability to avoid shocks or resist them – leading to a self-fulfilling, vicious cycle.
3. (non-active attitude towards the future or avoiding the future) While a psychological sanctuary may prevent or affect making tough decisions or understanding contextual risks. If managers are more prone to being blamed, they would spend less time thinking about the future and hence could be least likely to be protected from them. (risk cycle). Project managers must have a proactive orientation of dealing with situations emerging in projects. It is one of the habits of successful project managers (Laufer et al., 2015).
4. (lack of perspective and loss aversion) Being pessimistic about "the possibility that anything can change" may lead to large losses due to extreme conservatism. This is risk-aversion or maybe even risk-paranoia. Hopelessness destroys both the will and the ability to invest in one's future and one's capabilities.

CASE METHOD

Flyvbjerg (Flyvbjerg et al., 2003, Priemus et al., 2008;) develops methodologies for dealing with specific contexts such as 'emphasizing little things', 'getting close to reality', 'studying cases and contexts' and 'looking at practice before discourse'. Also, embrace of communal validity supplemented by extensive analyses of power and power relations between stakeholders. Learn through immersion and in studying real-world examples i.e., focus more on case studies and the involvement of political issues as well.

Drouin et al., 2013 have also discussed project management research methodologies via the study of case scenarios.

This paper is an attempt to use Flyvbjerg style methodology to understand the poor state of ethical construction practice in India.

We consider four cases identifying various issues that have become pertinent in the Indian context outlined below:

- project managers are not hands-on with risk management,
- also, when tools are applied without processes, the outcome is a poorer understanding of risk

- un-justified point-probability estimates for project risk or
- use of expected value without the backdrop of baseline risk contingency.
- the qualitative assessments represented by 5 x 5 matrix have become decisions! i.e., it is not clear how the cell is assigned in the matrix. (We advocate use of relative probability and relative impact measures so that the 5x5 matrix is effectively used.)
- risk assessments do not get updated often enough without an embedded scan for new risks.

Risk review/assessments do not yield the desired “(risk) quality” – which we define as efficiency in (risk) process and effectiveness of (risk) framework.

Case Study 1

The first case demonstrates the use of risk attitude more readily into risk assessments. This will also reflect the confidence in successfully managing the risk via appropriate strategies/ tactics. We introduce, for the first time, a straightforward way of assessing risk appetite. We digitize risk appetite curve (Hillson & Murray-Webster, 2012) from 1 (risk paranoid) to 9 (risk addicted) as shown below.

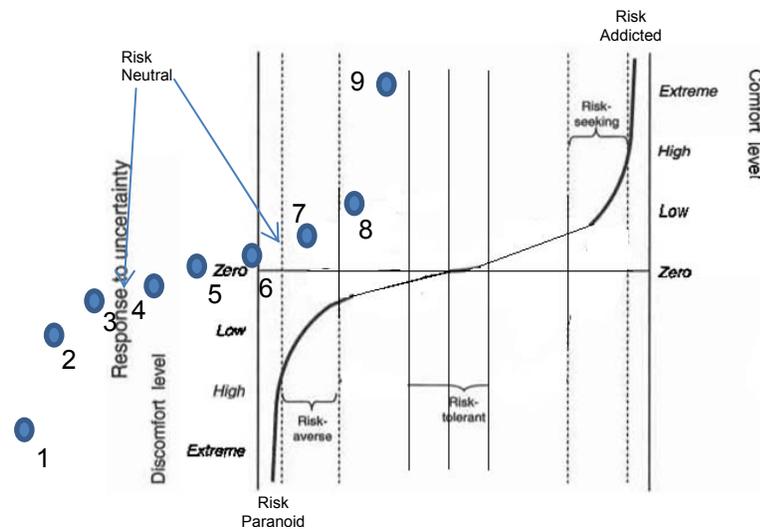


Figure 1: Digitization of the risk appetite curve.

We had a team of 30 engineering and construction managers who were given risk management training and were asked to evaluate risks from certain construction contexts. The managers were also asked to evaluate / self-assess their risk appetite for each of the construction contexts. We considered two risk categories i.e., engineering risks and construction risks.

Observation-1: Engineering managers who assessed engineering/design risks and construction managers who assessed construction risks were both found to be Risk Neutral to Risk Seeking/ Accepting (from 6 to 9). The managers agreed that they were confident in managing the said risk.

Observation-2: Engineering managers who assessed construction risks and construction managers who assessed engineering/design risks were both found to be Risk Neutral to Risk

Averse (from 1 to 4). The managers agreed that when they were asked to assess risks that had no exposure to, they had poor confidence in managing it.

Case Study 2

We used the video provided by Broad Construction Company (Xu, 2014) of a hotel construction executed at a Chinese site, (context) as a case study.

The super-fast construction of a 30-storey hotel is replete with lessons ranging from detailed planning to efficient utilization of equipment and a close working relationship with local government whereby the logistics is integrated with site execution (Just-In-Time).

This is not a fluke, the organization's project prowess and delivery is repeatable and sustained for over 15+ years.

The invisible story is the organization policies of this company. Workers are trained, and are full time employees (not daily wagers) and that CEO has a strong focus on worker interest and their families. Such an organization policy creates both committed and competent workers (see, for example, Lutchman, 2017).

The story in India is that there is "insurmountable" difficulty in obtaining local approvals from the appropriate stakeholders (i.e., *Decision made against you*).

Another big reason for success of Broad Construction Company, from my vantage point, is that there are no (big) decisions to be made during execution (stemming from the exquisite planning) and all the workers have precise instruction.

A number of next-practices are suggested in our work (Iyyunni, January 2015).

Case Study 3

Kahneman & Lovallo, 1993, discuss that poor decisions are due to conflict between RISK PARANOIA and ANCHORING BIAS with the following example.

Imagine that you face the following pair of concurrent decisions. First examine both decisions, then indicate the options you prefer.

Decision (i)

Choose between

(A) a sure gain of \$240

(B) 25% chance to gain \$1000 and 75% chance to gain nothing

Decision (ii)

Choose between

(C) a sure loss of \$750

(D) 75% chance to lose \$1000 and 25% chance to lose nothing.

Kahneman & Lovallo, 1993, found that 84% chose (A) and 16% chose (B) and 13% chose (C) and 87% chose (D). The data shows the test participants preferred risk aversion when options are favorable and risk-seeking when options are not-favorable.

In the Indian context, amongst project practitioners, our observations are similar proportions but the reasons are not precisely, risk aversion or anchoring bias but rather notions of gain and loss. These notions that the project managers harbor could be linked to the fact that Indian professionals are moving from the country-specific culture, Hofstede type of being “high” in the Uncertainty Avoidance Index (UAI).

We tested the reasoning by changing the probability and impact/consequence numbers to see if the behavior would change significantly – it did not!! The project managers seem “opportunistic” i.e., this is not risk savvy, as there is no formal risk assessment; the managers are grabbing benefit when possible – the full extent of the benefit may not be realized.

We also claim that if probability and consequence ranges/ distributions were given, assessments of confidence levels with Monte Carlo simulation (@Risk, 2015; Iyyunni, January 2015) would be easier. The simulation would also assess the combination effect of risk aversion and anchoring bias.

Case Study 4

We consider risk assessment as a decision akin to our work in Iyyunni, 2013; Iyyunni & Purohith 2013.

Following risks are envisaged. The construction project with major excavations (earthwork) with unknown stratified hard and soft rock formation as site condition. The sub-contractor commitment to project does vary during the life of the project impacting mobilization/ manpower availability. Another factor influencing the project is creating work-front(s) for the remaining scope for delivering substantial progress quickly. Finally, the condition of machinery (which usually deteriorates with time, unknown schedules of preventive maintenance). The project began in March-April of 2014 and was slated to finish June 2016.

The risk management session discussed below happened in the first week of September 2015 wherein the senior project personnel were on hand including project director, deputy project manager, and 10 construction managers.

The question posed to the team and for them to evaluate – whether overall risk increased as the project progressed? Most classical estimates and due to the fact that project personnel may be afflicted by anchoring bias, will usually claim that risk reduces as milestones are achieved and sub-structures completed. This scenario ignores the compounding mechanism between risks.

We used the analytical hierarchy process (AHP) technique (Iyyunni et al., 2014; Iyyunni & Purohith 2014) and expert choice software (Expert Choice, 2014) to make the assessment.

The objective was risk associated with the “progress of earthwork”. We used four criteria – namely, sub-contractor manpower availability (stakeholder risk), creation and availability of work-front (execution risk), condition of machinery (technology risk, inherent risk) and nature of strata (inherent risk).

The time-periods evaluated were (alternatives) Sept-Nov 2014, March-May 2015, and Sept-Dec 2015.

The criteria weights were used by pair-wise comparisons wherein each comparison was estimated by two construction managers with at least 10years of construction experience. The pair-wise comparison table is shown below:

	sub-contractor	workfront availability	machinery	Nature of Strata
sub-contractor		2.33	1.14	1.75
workfront availability			2.0	1.25
machinery				1.5
Nature of Strata		Incon: 0.00		

Figure 2: pair-wise comparison table for the criteria set.

The weightages for each criteria are as follows: sub-contractor manpower availability (34.8%), creation and availability of work-front (15.3%), condition of machinery (30.2%) and nature of strata (19.7%). The sensitivity analysis of the four risks as a function of time are shown below in Figure-3. Figure-3 gives a pair-wise comparison between alternatives for each criteria.

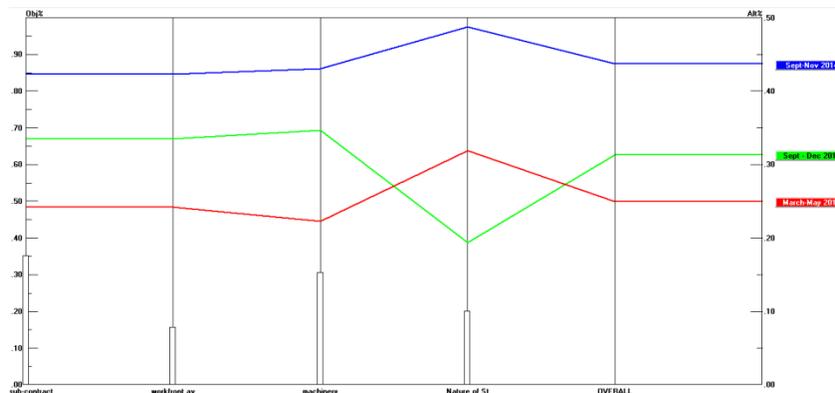


Figure 3: Sensitivity analysis of the criteria with respect to the objective.

The key factors were:

- (1) the rain during July-August has made the management of strata easier,
- (2) the latter phase of the project made work-front availability harder,
- (3) the latter phase of the project meant that there was excessive use resulting in poor condition of equipment, and
- (4) manpower were moving away to newer projects.

Figure-4 below shows the evaluation of risk for the future time-period, Sept-Dec 2016.

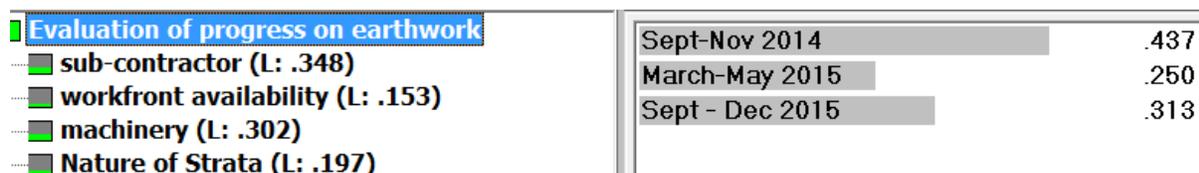


Figure 4: Four criteria overall project risk evaluation

We claim that the above assessment is reasonably robust as changes in criteria weightage will not impact the overall evaluation/ ranking between the alternative. The risk during Sept-Dec 2015 is almost 20% higher than March-May 2015 and the overall risk had reduced only 25% from the beginning of the project! Most literature claims that there is rather steep drop in risk with time elapsed in project.

We averted a poor risk assessment with the mitigations discussed above. The question of merit though – why have a highly competent project team missed this assessment?

DISCUSSION

At the larger level, the challenge for risk management in the Indian scenario are organizational in nature – be it structural or cultural or apparently-distracted senior management stemming from pressures in managing program, portfolio and governance requirements.

Herbert Simon in his address, when he received the Nobel Prize in Economics (Simon, 1974), mentions two laws of organizational behavior. We quote the second law, which is quite popular, though unattributed to Simon, demands “the use of right person for each activity”.

Ronald Coase 's, was awarded the Nobel Prize in Economics (Coase, 1991) for transaction cost theory of Organizations, for an insight obtained in 1937 that “with increasing overhead costs and increasing propensity for an overwhelmed manager to make mistakes in resource allocation, and promote *vested interests* (self interest) over organizational interests. While the extent and impact of this problem is not clear in the Indian context, these problems are usually tagged with managerial excuses that their “hands are tied” etc. which seems like a poor delegation of decision making (Loosemore et al., 2003) in the hierarchy of the organization.

Coase, also highlighted (in 1931) the risks of losing accountability via bad outsourcing practices and unnecessary activities by employees (for activity initiated and paid by company) such as filling up reimbursement bills for company travel.

She (2010), in her doctoral work exquisitely demonstrates the delineating role of trust in project alliancing. Trust between organizational stakeholders has been highlighted as an important attribute for conscious cultures. We also allude to the work of Sisodia and Mackay(2013) for creating conscious organizations – which have a sense of purpose, strong stakeholder integration, conscious cultures and management, and conscious leadership. This concept can be applied to projects and create an useful project governance model.

We claim that Infrastructure projects are a reflection of the social milieu (Miller et al., 2001). Hence, given the ground reality in India, one where economic growth is not linked to increased human capability (Kumar, 2016), project organizations will reflect the societal structures (Flyvbjerg et al., 2003) which for the case of India is a (1) lack of trained resources and (2) no freedom (bondage to low paying jobs) for the un-skilled workers.

The fallacy of shared decision-making in Indian Context – managing boss expectation rather than imperatives from project objectives is a major organizational condition not managed well. In the short run, the manager wins and the project objectives lose. Harvey suggests group methods to create processes to avoid Abilene paradox or mis-managed agreement. Also, poor

understanding and managing of group emotion which is a risk environmental condition (Adams & Anantatmula, 2010).

Harvey also suggests mitigation in the form of straightforward interactions based on eschewing negative fantasies, assessing real risks, and accountability based on values and ownership.

Dainty et al., (2005) discusses this point, from a different perspective, thru behavioral competencies.

In (Jha & Iyer, 2007; Lutchman, 2017), the researchers discuss the commitment, coordination and competence aspects of people management. Particularly, Lutchman's ground-making people-readiness model based on commitment and competency requirements of the human resource engaged in projects is crucial.

Commitment stems from

(1) meaningful work (including motivation, purpose, challenge, autonomy etc.) (Amabile & Kramer, 2011) and

(2) to manage the base level of Maslowian needs of taking care of safety and security of their family members – this is not in the state of the Indian construction worker (Kumar, 2016).

In (Dayal, 2012), the Delhi Metro Rail Corporation team suggests a host of steps in managing stakeholder sentiments which led to satisfying overall expectations and hence success of the project.

We see the inter-personal working relations (amongst stakeholders) is excellent - as per the TACTILE model spelled out by Sisodia & Mackay (2013), the project should be a success – and, it was.

In [36], we suggest a number of leadership and communication strategies for project managers to content with stakeholder management and leading teams. We demonstrate that potentially successful strategies are available for project managers – given, that the managers understand their strengths and surrounding culture – this is a competency issue [11, 39] – which is not understood by the construction managers for managing their effectiveness and delivering on project objectives.

In Iyyunni, (January 2015), we discuss “good human behavior practices” as does Dainty et al., (2005) on regaining hope in project execution.

We wish to add Sushil (2005)'s flow-stream strategies in the project context is a huge opportunity for the project manager.

Henisz et al. (2014) have worked over two decades on developing an astute perspective for managing local community stakeholders which is yet to catch on with the government, private owners or construction (main) sub-contractors in Indian Construction projects. We have earlier alluded to Japp & Kusche (2008) for managing the social risks – which are as important within the organizational context as it is in the external context.

Loosemore et al. (2003) show that a key characteristic of construction project environments is their unpredictability relative to static production industries.

Also, Briscoe and Hall (1999) discuss the demands a project places upon managers to respond flexibly to rapidly changing circumstances in order that they can re-plan and refocus their strategies for meeting competing project objectives. Together these conditions make it imperative for project managers to have a strong “future orientation” which is risk neutrality and in the face of crises, resort to proactive or preventive tactics (Remington 2012) to navigate thru the challenge).

Dainty et al. (2005) evaluated 43 characteristics for understanding a role based competency evaluation and developed a predictive model for construction project manager’s performance. They identify two parameters – self control and team leadership.

- (1) “Self-control” consists of a number of elements ranging from self-motivation, enthusiasm, self-discipline, and ambition, along with time management & taking initiative, reasoned and considered decision making, and analytical & conceptual thinking.
- (2) “Team leadership” consists of managing team socio-dynamics (see also, Adams & Anantatmula, 2010) and a clear, single-minded approach to decision making. Chinowsky et al., (2008, 2010, 2011) give a detailed characterization and methodology for managing the social (and stakeholder) milieu.

CONCLUSIONS

Duflo (2012)’s Hope-as-a-competency. The challenge with managing risk is to deal with hopelessness in the Indian context stemming from firstly, partially competent teams, secondly, un-committed workers (from un-trained, unskilled attributes) and thirdly, organizations overly focused on profit margins.

We offer a simple solution to Duflo’s challenge of the hopelessness and Harvey (2007) contextual analysis of vicious cycles in both inter-personal relationships and as “mis-managed” agreements in teams.

Hope Model

From our above discussions, we propose a “Hope model” for risk attitude which forms a virtuous cycle of the following elements:

- 1) Competence (knowledge, skills, experience, exposure), (Lutchman, 2017)
- 2) role (effectiveness and/or stress) (Pestonjee, 1998)
- 3) opportunity,
- 4) understanding risk/consequence of action or in-action (Banerjee & Duflo, 2011)
- 5) emotional intelligence, (Goleman, 2005)
- 6) managing inter-personal relationships (thru transactional analysis),
- 7) curiosity for options & disciplined experimentation (Banerjee & Duflo, 2011)
- 8) team support, (Kloppenborg, 2003)
- 9) organization support, (Kloppenborg, 2003) and
- 10) failure immunity (Matson, 2013).

REFERENCES

1. Adams, S. L. and Anantatmula, V, “Social and behavioral influences on team process”, Project Management Journal, Volume 41, Issue 4, September 2010, Pages 89–98.

2. Alladi, A., C. Iyyunni, Stakeholder Management-cross sectional study, PMI India Research & Academic Conference, Mumbai, 13-15 February, 2015.
3. Amabile, T., Kramer, S., "Progress Principle", Harvard Business Review Press, 2011.
4. Banerjee, A.V. and Duflo, E., Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty, Public Affairs, 2011.
5. Bhattacharya, S. , Momaya, K.S., Iyer, K.C., "Strategic Change for Growth: A Case of Construction Company in India, Global Journal of Flexible Systems Management, March 2013.
6. Briscoe, Jon P., & Hall, Douglas T. (1999, Autumn). Grooming and picking leaders using competency frameworks: Do they work? An alternative approach and new guidelines for practice. *Organizational Dynamics*, 28(2), 37–52.
7. Chapman, C. and Ward, S., How to Manage Project Opportunity and Risk: Why Uncertainty Management can be a Much Better Approach than Risk Management, Wiley, 2011.
8. Chinowsky, P. S., Diekmann, J., and Galotti, V. (2008). The social network model of construction. *Journal of Construction Engineering and Management*, 134 (10), 804– 810.
9. Chinowsky, P.S., Diekmann, J., O'Brien, J. (2010). Project organizations as social networks. *Journal of Construction Engineering and Management* 136, 452–458.
10. Chinowsky, P. S., Songer, A. D., *Organization Management in Construction*, Routledge, 2011.
11. Coase, R. H., The Institutional Structure of Production, Nobel Prize Lecture, December 9, 1991.
12. Dainty, A. R. J. , Cheng, M-I., Moore, D. R, Competency-Based Model for Predicting Construction Project Managers' Performance, *Journal of Management in Engineering*, Vol. 21, No. 1, January 1, 2005.
13. Dayal, A., "25 management strategies of Delhi Metro", Delhi Metro Rail Corporation Ltd, 2012.
14. Drouin, N., Muller R., Sankaran, S., *Novel Approaches to Organizational Project Management Research: translational & Transformational (Advances in Organization Studies)* Copenhagen Business School Press, 2013.
15. Duflo, E., "Lack of Hope and Persistence of Poverty - Hope as a Competency", Marshall Lecture, Oxford University, 2012.
16. Expert Choice Software, 2014, www.ExpertChoice.Com
17. Flyvbjerg B., N. Bruzelius and W. Rothengatter (2003), *Megaprojects and Risk: An Anatomy of Ambition*, Cambridge, MA: Cambridge University Press.
18. Goleman, D., *Emotional Intelligence*, Bloomsbury, 1995.
19. Harvey, J. B., "The Abilene Paradox and Other Meditations on Management", Jossey-Bass, 2007.
20. Harvey, J. B. , "How Come Every Time I Get Stabbed in the Back My Fingerprints Are on the Knife?: And Other Meditations on Management", Jossey-Bass, 2007.
21. Henisz, W., Dorobantu, S., Nartey, L. (2014), Spinning Gold: The Financial and Operational Returns to External Stakeholder Engagement, *Strategic Management Journal*, 35 (12), 1727 - 1748.
22. Hillson, D. and Murray-Webster, R., *Understanding and Managing Risk attitude*, Gower, 2012.
23. Iyyunni, C., Project Priority and Pressures from Portfolio Management, PMI India Research & Academic Conference, Mumbai, 13-15 February, 2015.
24. Iyyunni, C., V. Trivedi, V. Anantatmula, An analysis of the process in deriving further benefits of an AHP model, *International Symposium of the Analytic Hierarchy Process 2014*, Washington D.C., 30th June-2nd July. U.S.A.

25. Iyyunni, C., Purohith, M.S., Understanding Uncertainty in Account-specific Project Pipeline Management via Milieu Analysis in Engineering Outsourcing Industry, Project Management (India) national Conference, September 27-28, 2013.
26. Iyyunni, C., Residual risk quantification in the engineering outsourcing industry through Monte Carlo simulation, PMI Research Conference, January 31-February 2, 2013.
27. Iyyunni, C., Insights into Schedule Risks from Quantitative Analysis, Palisade Risk Conference 2015-Best Practices in Risk and Decision Analysis, January 13, Mumbai, 2015.
28. Iyyunni, C., Razor's edge: Managing Risk in the Indian Software Industry, Palisade Risk Conference 2016-Best Practices in Risk and Decision Analysis, April 19, Bengaluru, 2016.
29. Iyyunni, C., Regaining Hope: Ensuring Indian Mega-Project Scope and Schedule Performance, Palisade Risk Conference 2016-Best Practices in Risk and Decision Analysis, April 21, New Delhi, 2016.
30. Japp, K. P. and Kusche, I., "Systems Theory and Risk" in "Social Theories of Risk and Uncertainty: An Introduction". Edited by Jens O. Zinn, Blackwell Publishing Ltd., 2008.
31. Jha, K.N. , Iyer, K.C. , Commitment, coordination, competence and the iron triangle, International Journal of Project Management 25 (2007) pp 527–540.
32. Kahneman, D. and Tversky, A., Prospect Theory: An Analysis of Decision under Risk, *Econometrica*, 47(2), pp. 263-291, March 1979. "
33. Kahneman, D. and Lovallo, D., Timid Choices and Bold Forecasts: a cognitive perspective on risk taking, *Management Science*, v 39, n 1, January 1993, pp 17-31.
34. Kloppenborg, T.J., Shriberg A., Venkatraman, J., Project Leadership, Management concepts, 2003.
35. Kumar, S., personal communication(s), 2016.
36. Laufer, A., Hoffman, E.J., Russell, J.S., Cameron, W.S. , "What Successful project managers do", MIT Sloan Management Review, Spring 2015, pp 43-51.
37. Loosemore, M., Dainty, A. R. J., and Lingard, H. (2003). Managing people in construction projects: Strategic and operational approaches, E&FN Spon, London.
38. Lovallo, D., Kahneman, D., Delusions of success. How optimism undermines executives' decisions. *Harvard Business Review*, July 2003.
39. Lutchman, C. ,"Project Execution Management", CRC Press, 2017.
40. March, J. and Shapira, Z., "Managerial perspectives on risk and risk taking," *Management Science*, v 33 (1987), pp 1404-1418.
41. Matson, J., Innovate or Die, Amazon, 2013.
42. Miller, R. and Lessard, D. R., "Strategic management of projects", MIT press, 2001.
43. Miller, R. and S. Floricel (2005), 'Project risks', in André Manseau and Rod Shields (eds), Building Tomorrow: Innovation in Construction and Engineering, Aldershot, UK: Ashgate.
44. Miller, R. and Lessard, D. R., Evolving strategy: risk management and the shaping of mega-projects in Eds. Priemus, H., Flyvbjerg, B. and van Wee, B., Decision in Mega-projects, MPG Books, 2008.
45. Pestonjee, D.M., Stress and Coping: The Indian Experience, Sage Publ., 1998.
46. Priemus, H., Flyvbjerg, B. and van Wee, B., Decision in Mega-projects, MPG Books, 2008.
47. Project Management – Body of Knowledge, Project Management Institute (USA), 2015.
48. Remington, K., "Leading Complex Projects", Gower Publications (2012).
49. @Risk 6.0 Software, 2015, Palisade Corporation, <http://www.palisade.com/risk/>

-
50. Rolstadas, A. Heltand, P. W., Jergeas, G.F., Westney, R.E., "Risk Navigation Strategies for Major Capital Projects: beyond the myth of predictability", Springer Series in Reliability Engineering, 2011.
 51. Sanyal, S., C. Iyyunni, Scope Management of R&D Projects, National Conference on Industrial Engineering and Technology Management (NCIETM), National Institute of Industrial Engineering (NITIE), 29-31 October, 2014, Mumbai, India.
 52. Samset K., P. Berg and O.J. Klakegg, Front-end Governance of Major Public Projects, Concept Research Program, Technical University of Norway, May 2006.
 53. Seligman, M. E. P., Learned Optimism, Vintage 2006.
 54. Sen, Amartya and Dreze, Jean, Uncertain Glory: India and its contradictions, Allen Lane Publishers, 2013.
 55. She, L.-Y., Understanding the conditions of trust between governance and management within project alliancing. Ph.D work. Faculty of Architecture, Building and Planning, University of Melbourne, 2010.
 56. Shenhar A, and Dvir, D. (2007) Reinventing Project Management: The Diamond Approach to Successful Growth and Innovation. Boston, MA: Harvard Business School Press.
 57. Simon, H., Rational Decision-Making in Business Organizations, Nobel Prize Lecture, December 8, 1978.
 58. Sisodia, R. and MacKay, J., "Conscious Capitalism", Harvard Business School Press India Limited, 2013.
 59. Sushil, (2005). A flexible strategy framework for managing continuity and change. International Journal of Global Business and Competitiveness, 1(1), 22–32. Sushil, Flow Strategy, pre-print (2016). Sushil, personal communication (September 2016)
 60. Tversky, A., Kahneman, D., Rational Choice and the Framing of Decisions, The Journal of Business, Vol. 59, No. 4, Part 2: The Behavioral Foundations of Economic Theory. (Oct., 1986), pp. S251-S278.
 61. Xu, D., "How to build a skyscraper in two weeks - interview of Broad Group CEO Zhang Yue, Mckinsey Quarterly, May 2014. Also, www.youtube.com/watch?v=Hdpf-MQM9vY