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Title of the Paper: Integrating Risk Management and cost management to arrive at a realistic "Estimate at Completion"

Theme: Project Management leadership -> To accelerate Economic Growth

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Abstract:

It is a common headline in the newspapers to find that the cost of government led projects and/or infrastructure projects has exponentially increased. In the Project Management terminology, it meant that there are huge variances in the project Earned value metrics, which may or may not be monitored closely. One of the major root cause for this problem is that Risk Management and Cost management are seen as two different aspects of the project. In fact, effectiveness of the Risk management can reflect in the Earned value metrics such as cost variance and schedule variance. Even Risks related to schedule impact can invariably effect the project cost due to the Level of Efforts resources that are needed to manage the project.

This paper discusses on some of the innovative approaches and e-governance that can be put in place to integrate the Risk Management and cost management to better arrive at project "Estimate At completion". This paper also discusses some of the monitoring and controlling actions that needs to be refined to constantly evaluate the Risks and in turn the project "Estimation at Completion".

Table of Contents

Contents

List of Figures:

List of Tables:

1.0 Introduction

Sometimes, decisions in public sector and government funded projects are based on emotions rather than data, which may lead to huge opportunity costs. Imagine choosing a project over another potential project without proper risk assessment, and the result is indefinite delays and exponential cost increases.

One of the important aspect of the project plan is Risk management, but all the key documents in the public sector projects often lack enough detail about the risk assessment. There are general terms and conditions which states that "the sellers will have to manage the risks". There are numerous requests form the vendors/contractors to sanction additional tax payer's money for project completion.

2.0 Current Challenges

According to the Database of Infrastructure Projects in India (Infrastructure.gov.in), over 4.3 lakh crores was spent in the financial year 2016-17 alone. This amount roughly equates to 3% of the estimated GDP for the same period.

From the Database of Infrastructure Projects in India, 104 completed projects in the **energy sector** that were completed in the past 5 years were evaluated per the following criteria.

- Project cost greater than 500 crores rupees
- Government funded
- Traditional procurement process.

68 projects required more money than initially estimated and the highest being 3.65 times than the initial planned estimate.

Out of these 68 projects, 8 were beyond 100% over run and were eliminated in the analysis as they are considered as outliers. When the 60 projects were analyzed, each project required 33% more money than initially estimated. Considering that these 60 projects were at least 500 crores, that's a huge unplanned burden on the economy.

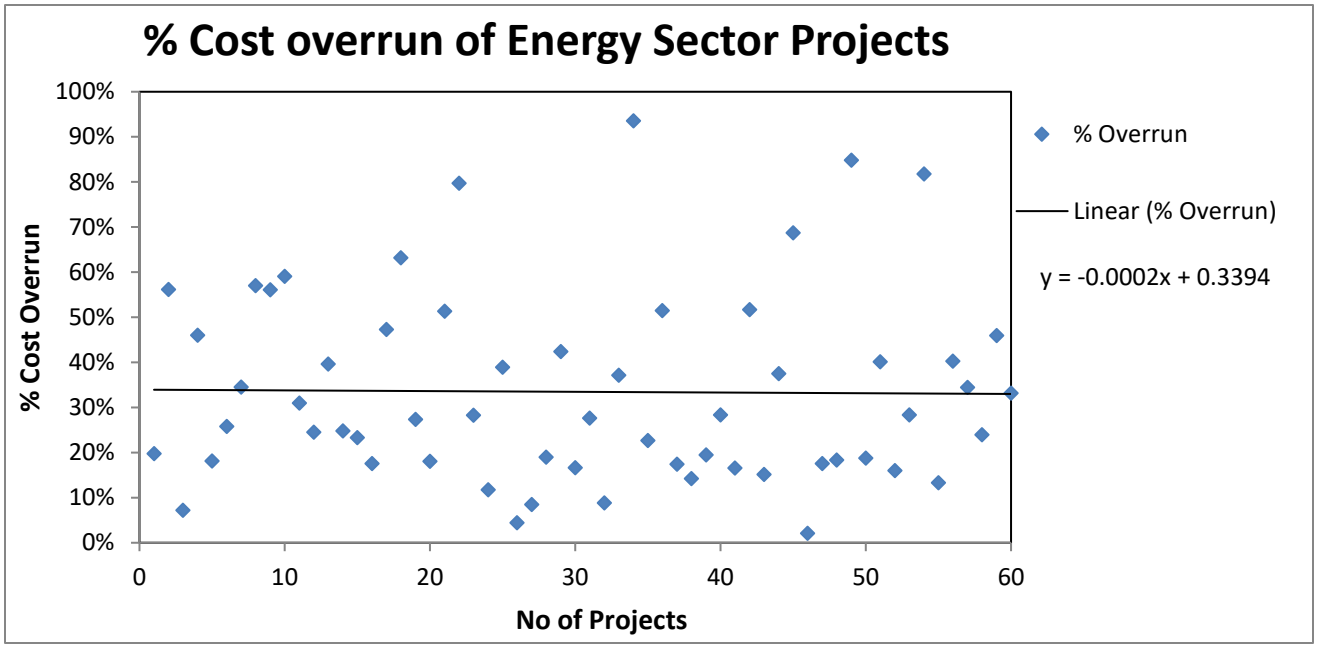

Figure 1: % Cost Overrun of Energy Sector Projects in India (Source: National Database of Infrastructure Projects in India)

Similarly, when 28 completed projects in transport sector were evaluated under similar criteria as defined for the Energy sector projects. 26 projects were overspent with the highest being 2.72 times the initial planned budget.

Out of 26 projects, 7 were beyond 100% cost overruns and were eliminated in the analysis. These 19 projects required an average of 40% more money than initially planned.

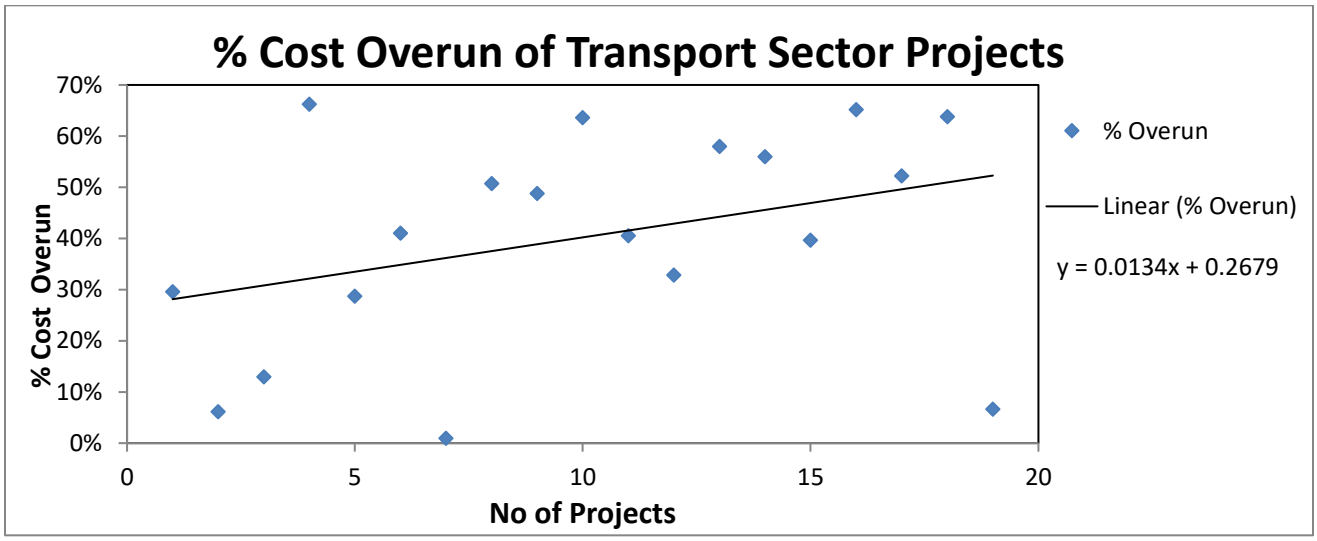

Figure 2: % Cost Overrun of Transport Sector Projects in India (Source: National Database of Infrastructure Projects in India)

Similar analysis can be done for projects across all sectors and it is expected to be no different than the above 2 analysis.

It is a known fact that most of the government funded non-defense projects are outsourced to vendors through tendering process.

Figure 3 shows the Overview of the government funded projects executed through traditional procurement.

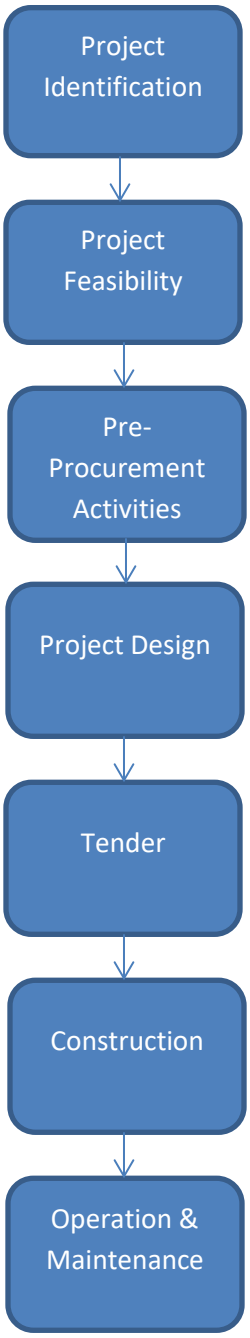

Figure 3: Overview of Government funded projects through traditional procurement

3.0 Risk Management

Ideally, Risk management should start at the very first step "Project Identification" and should be updated as and when more details are available or when the project moves to the next phase. In these projects document, there is very little emphasis and documentation on the project risk management. From the government perspective, risks could be from the activities that are awarded to a vendor or activities that are beyond the vendor like cost of land acquisition/on or project specification changes.

Given the past performance, vendors may be very much inclined to submit their quotes based on success oriented plan in an effort to improve their winning chances. This is one of the primary season why there are lot of assertions from the vendors during the course of the project.

3.1 Factors for successful implementation of Risk Management

The key to the success of a formal risk management plan in the government funded project lies in the simplicity rather than the complex algorithms and predictions. The process can be matured as the respective stakeholders are comfortable with the Risk Management process

This paper uses the Risk management philosophy as outlined in the PMBOK, but introduces additional dimension of Cost to the Risk management. The 4 major steps of Risk management are

- Risk Identification
- Qualitative Risk Analysis
- Quantitative Risk Analysis
- Plan Risk Responses

Risk Identification should include both Internal and external factors. External should include risks from natural calamities, safety incidents.

3.2 Risk Identification

Risk Identification is the most important step to get this process rolling. Risks should be identified at the "Project identification phase" and should include all the known risks applicable to all phases of the project.

If available, Risk repository should be reviewed and appropriate risks should be entered in the Risk Register. If not available, use this as a starting basis for creating a Risk Repository.

Risks can be categorized in to the following. More categories can be added as appropriate

- Technical Risk
- Social & Environmental Risk
- Legal Risk
- Quality Risk
- Vendor Risk

This step also includes documenting the effect of the risk, which is the result if that risk is realized.

3.3 Qualitative Risk Analysis

This process involves analyzing the likelihood of each risk occurring and the impact of the risk if occurred. Both Likelihood and Impact are analyzed on a scale if 1-5 with 1 being low and 5 being high.

At the end of this process, the Risk register would be as seen in Table 1.0

Risk ID	Risk Category	Risk Description	Effect of Risk	Likelihood of Occurrence	Impact of Occurrence
Risk ID number	*What is the category of Risk*	*Explain the Risk to the project*	*What are the resultant events if the Risk occur*	*Likelihood on a scale of 1-5*	*Impact on a scale of 1-5*

Table 1: Risk Register after Qualitative Analysis

Based on the project type and the appetite for Risk, the criteria for likelihood and Impact can be defined and the probability Impact matrix could be developed.

3.4 Quantitative Risk Analysis

Quantitative Risk analysis can add a lot of value to the project due to additional insight it offers to the risk. There are several techniques that are available to perform quantitative risk assessment including computer simulations.

Before proceeding further in to the quantitative risk analysis, we would define a few parameters that would help enhance the Quantitative risk assessment.

3.4.1 Overhead Cost per day:

Based on the size of the project and the past experience, the governing body should come up with the indirect/administrative cost per day to execute the project. This is the cost to the project even when the project is kept on hold

This factor will be used as the basis to calculate the cost overruns in the event of schedule delays. This factor should be revisited each financial year to include the changing inflation.

3.4.2 Parking Cost per day:

If the project is kept on an indefinite hold, it is obvious that all the resources would be released at the earliest. However, if the project has to be kept on hold for a few days due to the realization of a risk, the cost of all the resources would have to be borne the project.

This is typically all the direct resources that are allocated to the project. Note that the resources also include equipment, facilities etc...

These 2 factors should be the start and could lead to several other factors related to vendor (if we have a history of the vendor past performance with quality and delivery.)

For every risk identified and documented in the risk register, the next step is to identify the cost impact due to the effect of risks.

For instance, if it is identified that the effect of a specific risk is a delay of 2 weeks to the project, then in that instance the cost impact of this risk would be

14 days X (Overhead cost per day + Parking cost per day)

This cost impact would be in addition to any infrastructure cost due to this risk. In our example, if the 2 weeks delay is to procure the new tool, then the total cost impact would be the cost of the new tool and the cost impact due to 2 weeks of schedule delay considering the Overhead cost per day + Parking cost per day

At this moment, our risk register with qualitative and quantitative risk assessment would be as defined in Table 2.0

Risk ID	Risk Category	Risk Description	Effect of Risk	Likelihood of Occurrence	Impact of Occurrence	Cost Impact of the effect of Risk

Table 2: Risk Register after Quantitative Risk Assessment

3.5 Risk Responses:

For every risk and its effect, we should identify a response/action on how to handle this risk. The common approaches are

- Avoid - Eliminate the Risk by making necessary changes to your project
- Transfer - Place the risk responsibility on another party
- Mitigate - Plan action to reduce the likelihood of occurrence and/or impact
- Accept - Accept the Risk and its effects.

Note that, there could be opportunities as well which would impact the project in a positive and there are strategies to realize the opportunities.

In our example, the project is on hold for 2 weeks as new tools are needed. While, this has negative impact on the current project, there could be opportunity to improve the effectiveness in future projects.

Now that there is a Risk response in place, a quantified cost has to be identified for implementing each Risk response. Ideally, the cost of risk response would be less than the cost impact of risk if realized.

Risk Register at the end of this process would be as seen in Table 3.0

Risk Category	Risk Description	Effect of Risk	Likelihood of Occurrence	Impact of Occurrence	Cost Impact of the effect of Risk	Response Type	Response /Action	Cost of Risk Response
Risk Category	*Explain the risk to the project*	*What are the resultant events if that risk occurs*	*Likelihood on a scale of 1 – 5* *1 being low and 5 being high*	*Impact on a scale of 1 – 5* *1 being low and 5 being high*	*What is the cost impact due to the effect of this risk*	*What type of Risk strategy is applied* *(Avoid, Transfer, Mitigate, Accept)*	*What are the actions to handle the Risk*	*Cost of Implementing the Risk Response /Action*

Risk ID	Risk ID Number

Table 3- Complete Risk Register

4.0 Project Estimate at Completion (EAC):

Given the past history with government sector projects, there is clear data to substantiate that the projects would not be completed on budget as planned initially. If Risk management is performed adequately, we could arrive at a realistic "Estimate at Completion" (EAC) cost for the project.

To calculate the EAC, the project budget should include the Project estimate and cost of Risk responses. If the response is to accept, we should add the cost impact of the Risk to the project budget.

It may also be advisable to add weighted cost of the Risk impact to the project budget, given the uncertainty of the risk responses in large government sector projects. While this amount is not assigned to the project budget, it should be considered in the project cost benefit analysis. If supported by the PM practices of the governing body, it could be a guidance to the appropriate Management reserve for the project.

The weightage could be

Sum of impact costs of all risks X Likelihood in % X % of Risks that are realized in the past projects.

This figure should be used strictly for the purpose of business case evaluation and to factoring in the management reserve that should be assigned for this project.

As the Risk management process becomes more matured, the need for accounting additional factors may be reduced/eliminated

To make it a close loop, Risk Register should be a dynamic document and must be reviewed on a frequent basis as defined the Risk management plan. To make the Monitoring & Controlling easier, a Dashboard could be created at the sector level comprising of all projects and a dashboard of each project that are considered as high risk and/or meets a defined cost threshold.

Based on the Risk scores and the cost threshold, it is recommended that the projects should be reviewed at appropriate governance meetings of the respective sector.

5.0 Conclusion

Across all sectors of government funded projects, cost overruns are visible which means there are surprises awaiting the project. Risk Management is a powerful tool that could avoid/minimize the surprises leading to cost overruns. Knowing these surprises in advance would help from the project prioritization and selection.

The key success factor in implementing the Risk management lies in the simplicity and should be easily adaptable across the length and breadth of the government system.

Quantitative Risk analysis is one of the solution to not only understand the impact of the risk but also predict the additional cost that could hit the project. One of the advantage of the government sector is the access to vast data that could be analyzed to predict the "overhead cost per day" and "parking cost per day"

Monitoring & controlling actions would be key to sustain the Risk management. Centralized dashboards could be developed and used to review the risks and its impact. Depending on the criticality, project size and the cost impact derived from the quantitative risk analysis, governance reviews can be set up at appropriate levels in the government organization.

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