ENTERPRISE RISK AND OPPORTUNITY MANAGEMENT: THE DREAM AND THE REALITY

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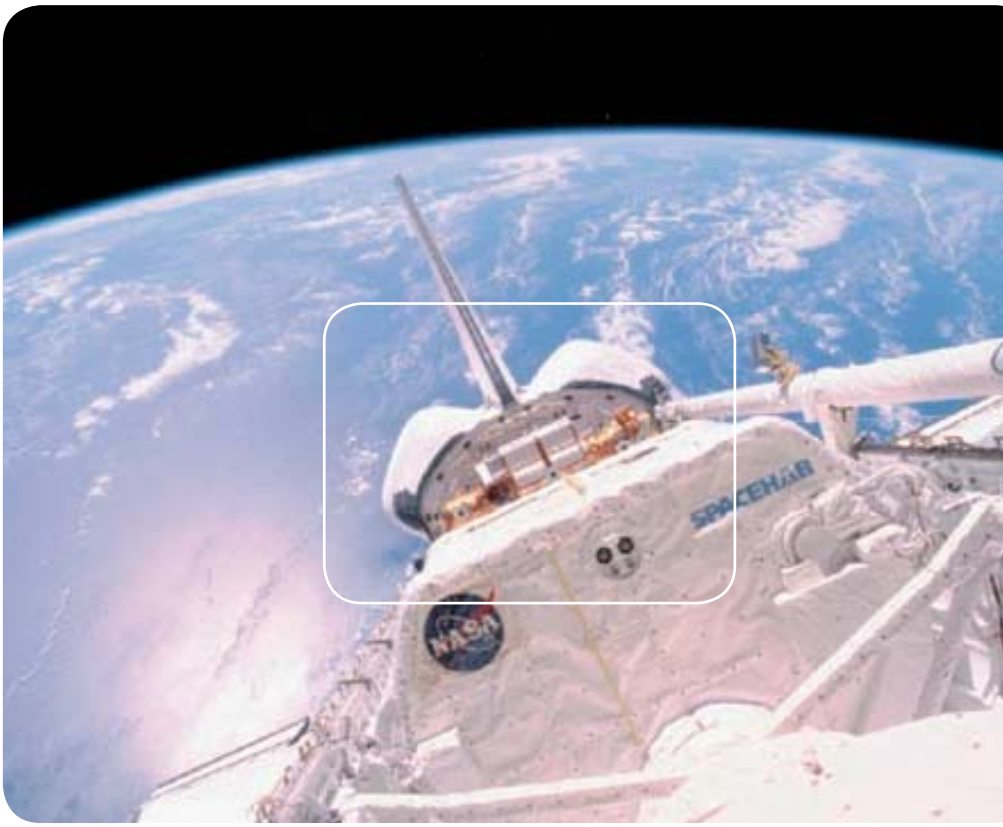

Abstract

Projects at Northrop Grumman Space Technology (formerly TRW) have demonstrated the benefits of risk management by completing delivery ahead of schedule and under budget because the well-executed risk management process enabled them to avoid many problems and minimize the impact of anticipated issues.

This paper continues the story with an account of the promise and shortfalls in the ongoing application of a COTS risk management application called Active Risk Manager to provide a common tool for use across all projects in the enterprise.

The dream for Northrop Grumman Space Technology (NGST) has been to have all projects enjoy the performance benefits of rigorous risk management by implementing the standard risk and opportunity management process across the enterprise. The ideal risk management tool allows all projects to share a common database, though each project views only their project information. The dream tool enables anyone – customers, subcontractors, suppliers or internal project team - on each project to submit a candidate risk or opportunity via a web browser and quickly alert technical and management personnel through email or cell phone contact. NGST has licensed the Active Risk Manager application that implements these features and allows each project to use a tailored set of criteria to analyze risks while all projects share a common master probability/impact matrix. Quantitative Monte Carlo analyses of cost and schedule risk are available within the application, and links to project schedules to track risk mitigation tasks, links to project requirements and links to process flows provide additional insight into ways to control the risk and enhance the opportunities. Executive management overseeing multiple projects can observe all risks to search for common issues that can be attacked by enterprise-wide preventive action. This paper describes the process of selecting a risk management tool that has enabled many aspects of the dream risk management process, and presents the reality that there is still plenty of room for improvement.

The Dream of Enterprise Risk Management

The dream of an enterprise-wide risk management practice stems from the fundamental belief that a well-executed risk management process will result in projects encountering fewer issues and thus complete earlier and at lower cost.

I became a fervent backer of this idea while managing the Hyperion project that delivered the hyperspectral imager to NASA Goddard Space Flight Center ahead of schedule and under budget by implementing a rigorous risk management process. Shortly after this success, the company established this rigorous risk management process as a requirement for managing all projects.

I have been training others in this process for the past five years and have watched as projects reap the benefits of the proactive process at Northrop Grumman Space Technology (NGST). While not every project was completed ahead of schedule, they have averted many issues by early identification of risks that enabled them to avoid or mitigate them.

Further, enterprise risk management could benefit from an overseer who can observe all risks on all projects and find risks common to multiple projects. Once such risks are identified, the enterprise could apply additional resources to support mitigation of such risks across the enterprise, thus benefiting all projects. Even without additional resources, the sharing of successful mitigation strategies across projects with similar risks could have a significant effect.

Step One: Establish an Enterprise Risk Management Process Standard

Probability %	Risk/Opp Rating
> 70	E - Very Likely
40 to 70	D - Likely
10 to 40	C - Possible
1 to 10	B - Unlikeley
<	A - Never

Figure 2: Sample % Probability Scale

To achieve this organizational dream of enterprise risk management, several conditions must first be met. First, all projects must use a standard risk management process. If projects all used different processes, any comparison of risks from one project to another would be, at best, confusing and, at worst, meaningless.

Each project must be allowed to tailor the process to match their unique requirements, but a common process provides a basis for understanding risk scores across multiple projects. Such tailoring primarily establishes appropriate impact scales for scoring the impact of risks.

The enterprise issue of having a uniform application of a rigorous risk management process is a macro view of what must be achieved within large projects. Everyone must apply the cost risk rating of impact and probability in a manner consistent with their project budget. A large project is typically comprised of multiple subproject teams (integrated project teams or IPTs), and each team should score risks for their subproject consistently.

For example, all subprojects might consider a 'severe' cost impact to be 15% of their subproject budget or higher, and a 'negligible' impact to be less than 2% of the subsystem budget (See Figure 1). Such a scale would thus enable each project or subproject to apply criteria proportionally to the budget for that subproject.

Other impact scales include one for schedule impact that can be scaled according to the project schedule duration, and a technical performance impact scale that is tailored according to the nature of the project.

Similarly, all subprojects would use a common probability scale or set of scales, as appropriate for each risk (see Figure 2). And all risks would be scored with a single scoring matrix that translates the probability and impact into a risk score. (see Figure 3). Such standard criteria would then enable the project manager to understand how risks are scored across the project.

If possible, the risk scoring could be recomputed as each individual risk is viewed from higher levels of the organization. For example, a risk that has a 'high' rating at the subsystem level, may be scored a 'medium' rating at the project level, since the budget reference is larger and thus the same risk impact estimate would score lower on the cost impact scale tailored for the budget at the project level.

This layering of criteria can also be applied at the enterprise level, where a standard can be set for the cost impact and schedule impact that would re-rate the risks across multiple projects. When risks then are scored 'high' at the enterprise level, they would receive much attention as they may represent a threat to the organization.

Negligible	Minor	Moderate	Significant	Severe
< 2% of budget	2 to 6% of budget	6 to 10% of budget	10 to 15% of budget	> 15% of budget

Figure 1: Sample Cost Risk Impact Scale

Step Two: Establish a Risk Management Process Owner and Document the Process

At NGST, as the process matured through its application across many projects of all sizes, it became a standard process, and a process owner was assigned – the first step in realizing the dream of enterprise risk management. The company policy manual for project management was updated to require that all projects perform risk management in accordance with this process. A guide to the application of the standard risk management process became a chapter in the manual of program management process standards. At NGST we have added opportunity management to the risk management process. Opportunities are those future events that, if they happen, can reduce project cost and/or schedule, or improve project technical performance. Opportunities are handled by the same process as handling risks: identification, analysis, and handling. The beneficial consequences and probability of their occurrence can be combined in the same manner as risks to achieve an opportunity score (see Figure 3) by scoring benefits as a negative number, since they subtract cost and schedule.

Step Three: Provide Training in the Standard Risk Management Process

Establishing a company risk and opportunity management policy and making sure that all projects implement the process correctly requires training. So the next step in the process is training to provide instruction to project managers, systems engineers and the project team on how the process works.

Project managers must understand and champion the process, or the process will be ineffective. If the project manager does not remain receptive to the reporting of risks, the team will soon stop seeking to identify risks. In the same vein, a project manager should celebrate the retirement of risks by giving praise to the risk owner, thus conveying the message to the team that he supports the identification of risks.

System engineers often perform the process, and serve as the project risk manager, so they too must understand the process and help the team by encouraging them to identify and document their risks and opportunities.

Step Four: Monitor and Enforce the Implementation of the Risk and Opportunity Management Process

To ensure the process is properly executed in projects, an experienced project risk manager is needed to support an audit process. In short term, NGST imposed a self-audit reporting as part of the monthly review process. Each project manager is asked to score his project's compliance with the risk management process and other project management processes.

Such self-auditing does not have the rigor of an outside auditor who is familiar with the process, and leaves the standards for such an audit in the

Figure 3: Risk & Opportunity Scoring Matrix

Probability	-5 Major	-4 Significant	-3 Moderate	-2 Minor	-1 Negligible	0	1 Negligible	2 Minor	3 Moderate	4 Significant	5 Severe
E Very Likely	-10 High	-9 High	-7 Med High	-5 Medium	-3 Low Med	0	3 Low Med	5 Medium	7 Med High	9 High	10 High
D Likely	-9 High	-8 Med High	-6 Medium	-4 Low Med	-2 Low	0	2 Low	4 Low Med	6 Medium	8 Med High	9 High
C Possible	-8 Med High	-7 Med High	-5 Medium	-3 Low Med	-2 Low	0	2 Low	3 Low Med	5 Medium	7 Med High	8 Med High
B Unlikely	-7 Med High	-6 Medium	-4 Low Med	-3 Low Med	-2 Low	0	1 Low	3 Low Med	4 Low Med	6 Medium	7 Med High
A Very Unlikely	-6 Medium	-5 Medium	-3 Low Med	-2 Low	-1 Low	0	1 Low	2 Low	3 Low Med	5 Medium	6 Medium

hands of the project manager. Thus, if the project manager has not been trained and has a different idea of how risk management is to be conducted, then the intended uniform application of the process falls down. With a less effective oversight, there usually follows an ineffective implementation of project risk management.

The Risk Management Dream Tool

The idea of a computer-based tool to support the risk management process seemed to be an attractive way to overcome the resistance a project team often has to the initial implementation. Since the risk and opportunity management process is designed to draw insight from the entire project team to help the project manager understand the potential issues he faces, a collaborative tool would be very useful. The access to the application by the project team, including subcontractors, suppliers and the project client would draw upon the experience of all project personnel.

A web-based application that allowed anyone who could access the secure pages dedicated to their project would enable the submittal of candidate risks to the project. The online system would ideally alert the project risk manager that a new candidate risk has been submitted. A risk owner can be assigned if it is someone other than the risk originator.

Online review and approval of the risk would expedite the process. Once approved as a risk or opportunity, the analysis would be quickly documented and the risk scored by having the project-tailored scales for probability and consequence available within the application.

Once a risk or opportunity is scored, a ranking of the risks and opportunities focuses attention on the highest risks and biggest opportunities. The application would automatically provide such a prioritized list for consideration by the team for handling of the risk or opportunity.

Handling plans are documented online and submitted to the risk management board for authorization of funds from the management reserve to initiate the risk mitigation or opportunity pursuit. Steps of the handling plan are documented and the sequence of steps is exported to the project schedule for regular status review along with the project master schedule.

A web-based tool also provides access to risk information by anyone on the project team. Security controls within the application will allow each project to see their own risks, but not those of other teams across the enterprise. A lessons-learned database would be accessible by all project teams. Each time a risk or opportunity is retired, it would be recorded in the lessons-learned database for access by other project teams across the enterprise.

The Reality of Enterprise Risk Management

Sound too good to be true? NGST engineers soon assembled an internal database application that had many of these features. Called the Risk Control Center, the homegrown application was considered for use across the enterprise.

COTS Tools

As the Risk Control Center was undergoing a redesign for application across the enterprise, a study was initiated to evaluate a number of commercial off-the-shelf (COTS) tools to determine if the internally developed tool was the most cost-effective means of implementing our risk and opportunity management process. Our study found there was one tool that would provide many of the features we were looking for, including opportunity management. That tool was the Active Risk Manager (ARM) application. The ARM application also was more advanced in many ways and had several more features than our tool, so we engaged a dialog with the manufacturer, Strategic Thought Limited, headquartered in London.

Some of the features that attracted us to ARM included the ability to link the risk management data to external project management applications. A link to the project schedule applications provided a way of exporting the risk and opportunity handling plans to the project master schedule and updating the handling plan from the schedule application.

Other application links are provided to DOORS, a database that organizes project requirements, so that risks and opportunities can be linked to requirements, enabling a tracking of which requirements are driving the most risks. And the ARM application can link to Visio, a process flow diagram application, so that risks can be linked to various steps in a project process flow.

ARM also can import and export risk and opportunity information from and to the Excel spreadsheet application, providing a means of linking risk management information to other risk management processes from other companies, for example. Alerts can be issued by the ARM application, in accordance with instructions programmed by the project, such as alerting the risk manager when a new candidate risk has been submitted.

The ARM application has a built-in Monte Carlo analysis capability for evaluating cost and schedule risk. This analysis can be useful in estimating the cumulative effect of all risks and opportunities on a project.

After a few months of discussion and negotiations, NGST licensed the ARM application for use across the NGST enterprise, where approximately 150 projects, valued from several billion dollars to a few $100K, are in process at any time. The first usage of ARM was initiated approximately one year ago. The plan for implementation was to roll out the application on the largest projects first, at a rate of about ten projects per year.

We have exceeded the target number of projects across the enterprise and found the application provides most of the capability that we wanted. The application has been tailored to match our rigorous risk and opportunity management process. Additional features are added regularly, some at our request, some at the request of other users, but all users of the tool have access to all the capabilities as upgrades occur two or three times each year.

In the past year, several of the largest NGST projects have utilized the ARM application in the management of risks and opportunities. These projects include the James Webb Space Telescope (JWST), the National Polar-orbiting Operational Environmental Satellite System (NPOESS), the Space Tracking and Surveillance System (STSS), the Joint Strike Fighter (JSF), and Jupiter Icy Moons Orbiter (JIMO) programs.

By implementing the application on a large, fast server for use by all projects, we now have the ability to provide a view of all risks from all projects across the enterprise, and so we are now poised to begin realizing the dream that stimulated the strides toward this capability.

Barriers to Enterprise Project Risk & Opportunity Management

There are, however, still a few barriers to the realization of the total enterprise risk and opportunity management process.

The most fundamental barrier to implementing any risk management process across the enterprise is that not all project managers understand the value of the risk management process, and are not convinced a standard risk management process is an important part of their management tools. Consequently, many projects fail to achieve the full benefits of the risk management process.

Some small projects believe that the process is too complicated, regardless of whether they use the ARM tool or not. Some project customers occasionally dictate a different risk management process, sometimes with a different risk management tool.

And web tools are not perfect. Some features were designed to work when the application is used exclusively for a single project, but when we added multiple projects, the ARM tool proved less capable. These features include ARM links to MS Project, DOORS and Visio, as well as the ability to issue alerts, and changes are expected by the time of this conference to correct these deficiencies.

But ARM currently provides the enterprise view of all risks on all projects, so we are poised to begin reaping the benefits of enterprise risk management originally envisioned. But the single biggest barrier is the lack of an enterprise risk manager, someone that will use the tool to study the enterprise view, as we imagined at the outset. A chief risk officer as has been established in some sectors of Northrop Grumman, and is under consideration for NGST.

Steps to bring down these barriers are under discussion and I am confident that NGST, in time, will overcome many of them, and bring us closer to the dream.