Document Purpose:
This document is a follow up to the Risk Management 103 Metrics – Measuring Risk and the Risk Process document of September 23, 2014. It utilizes the example project case in that document with 20 fictitious risks of various values for the risk attributes – Probability, Impact and Timeframe to show how the Risk Mitigation budget can be managed by various strategies. Application of these metrics to form a risk priority list shows how a program can provide which risks to focus on to achieve best quality for the risks it has. Additional metrics are indicated for assessment of handling performance and metrics to report for assessment of how the risk management process is working. A special case called “Deep Risk” is shown to identify how to handle this kind of risk.

Audience:
• Anyone who is interested in Risk Management (RSKM) and how it is used to advance the quality of a program.

Prerequisites:
• An understanding of how programs and projects are managed.
Agenda

- Applying ROI to Establish an RSKM Budget.
- Risk Mitigation Strategy Adjustments for more Budget Applications.
- Risk Priority Considerations.
- Risk Handling Metrics to show how well the RSKM Process is working.
- Bonus – Deep Risk: What is it and how to handle it.
This is a fictitious example of a project with 20 risks of various impacts and probabilities. (See backup slide (#26) on Common Criteria Levels for information on Impact and Probability values used.) The exposure value is simply the Impact Value times the Probability Value. The ROI (Return On Investment) is the Unmitigated Cost minus the Mitigated Cost.

A red line can be drawn at the accumulated mitigation cost representing approximately 10% of the project budget. This is the first order estimate of the risk budget and which risks can be accommodated. Management decisions are then needed to cover more risks with an augmented budget, if necessary.

There are 4 ways to lower this red line in this table.
1. Request more funding for risk mitigation from the funding source.
2. Consider an across the board cut in mitigation costs for all risks. (See Slide # 4).
3. Consider various strategies to adjust mitigations. (See Slide # 5).
4. Consider delaying mitigation spending on the far term impact risks. (See section on Priorities below).
(Note: It is advised to explore the above options 2, 3, and 4 before doing option 1).
This is a list for a given date. Periodically, after some changes, this list is re-composed with updated numbers and the risk budget can be reviewed and updated as needed.

Note: The headings shown in blue shading are fictional numbers and the values with a white background heading are calculated.
One way to get more budget to handle more risks is to do an across the board cut on mitigation plans. This table shows where the red line is shifted due to this mitigation cost cut for the various amounts shown by the blue arrows. The red line represents a limit of the Accumulated Mitigation Cost up to the $1M budget example for each of these cost cuts.

Note: The headings shown in blue shading are fictional numbers and the headings with a white background are calculated.
Use these levels of Risk Mitigation to throttle levels of activity for each risk:
- Prototypes and / or models should only be developed to the extent they are needed and nothing more.
- Prototypes and / or models can be used for more than just one risk.
- Actions sets for a given risk can be expanded or contracted for most efficient use of resources.
- Build a Prime strategy plan for handling a risk.
  - Use Backup plans if the Primary plan is not working.
  - Use Contingency plans if and when impact begins to occur.
- If the estimated Impact Date makes the risk a Far Term Timeframe, consider delaying most of the mitigation effort until a later date. But consider minor resource spending long before that date to take advantage of the long lead time leverage.
Continuous RSKM Considerations

A Program life cycle may contain several phases, intervals, spiral cycles and the like.

The RSKM Process is made for a repetitive flow.
- As new risks are identified, analyzed, and costed, a revised budget balance should be made.
- A wise Program Manager will have a reserve to accommodate new risks.
- One key to Program success is to identify far term risks early.

*How to do this?*

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How to Identify Far Term Risks

- Consider that all risks derive from false Assumptions.
- Project how the goals of a subject project are met.
- Do an Assumptions analysis to list all assumptions involved in achieving the projects goals and objectives.
- Separate the good Assumptions from the false Assumptions.
- Work the false Assumptions as Risks.
- Manage those Risks early in the project or program.

This is a factor when forming a Priority List

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Note most managers focus on the upper right corner of this profile to identify priority. Other factors need to be considered for priority – namely ROI, Timeframe, and Management / Stakeholder preferences.

The red checks shown are risks that can be covered with a 10% budget in this example case. The orange checks show additional risks that can be covered with an additional budget of 15% of the original risk budget.
These factors come from the Risk Analysis activities, but are they the only considerations for making a Priority list?
These factors come from the Risk Analysis activities, but are they the only considerations for making a Priority list?
By considering the added factors of ROI and Time Frame, many changes can occur in a list of top 10 risks.
Sometimes management preferences can usurp the numbers from Risk Analysis. A manager may have a good reason for making an otherwise low priority risk to be the number one or two priority. This could be due to interior political reasons, biases the management may correctly have from the projects history or the manager’s history, or other organizational influences which may dominate risk handling preferences. In all such cases the management needs to at least be aware of the Risk Analysis and ROI factors.
The added factor of Stakeholder Values needs to be considered by management when formulating a Risk Priority List. These values may have to do with how the product or service is to be used and any customer considerations. For example a software product may seem very easy to use by a developer, but may be very complicated to a user not knowledgeable of the internal workings of the product.

The Management Preferences still Trump the Stakeholder Values since Management is responsible to provide the product or service under all constraints including budget that may come from the Stakeholder. However, Management needs to be aware of the Stakeholder Values in order to factor them in as appropriate.
The ROI for all known risks are estimated before any resources are spent, and in the risk process map, this occurs after all strategies are identified with all actions and all costs associated with the handling of each risk.

ROI = Unmitigated Risk Cost – (minus) Mitigated Risk Cost.

It is only after the cost analysis is done for each risk and a Priority List is established with appropriate considerations for Management preferences and Stakeholder Values that any chargeable work should be started on any risk.
Risk Handling Metrics to Consider
Risks that are to be Handled:

- 90% of risks have a documented handling strategy.
- 80% of risks have more than 2 action steps.
- Average planned duration of action steps is < 30 days.
- < 10% of risks have their impact date in the past.

These are internal metrics to expose how well the RSKM Process is working. This data over time can be used to show RSKM Process improvements.
Periodically management may want a report on the progress of Risk Management on his program. Items that should be in this report include are listed above. It therefore is advisable to log dates when status changes on any risk. Showing these trends then helps answer the question: Is this process working?
Risks in the upper right corner of the Risk Exposure profile that have very high timeframes are called ‘Deep Risks’ because they are essentially ‘deep’ in time and may take a great deal of effort to ‘dig’ them out. But, given enough time, they are certain to occur and their consequences are usually catastrophic.
The characteristics of these Deep Risks are:
- The events are inevitable and catastrophic, but have very long timeframes.
- They have their own significant unknowns and misunderstandings.
- The priority is usually considered very low.
- Most have a ‘shot across the bow’ in recent history.
- Most, if not all, have a strategy to reduce the risk.

Note*: A philanthropist – Jeffery Skoll – has created a Global Threats Fund whereby he is helping to fund solutions for the following 5 Global Threats:

1. Climate Change
2. Water Security
3. Pandemics
4. Nuclear Proliferation
5. Middle East Conflict

How to Handle a Deep Risk

Establish a low priority budget that is used every year to make progress on a real solution.

Annual Budget = \frac{(Total \ Solution \ Cost)}{(Event \ Cycle \ time \ in \ years)} \times 10^*

*The “10” factor is an acceleration factor that allows the solution to be available at a fraction of the Event Cycle. In this case the “10” provides a solution in 1/10th of the Event Cycle. A value of 20 would provide a solution in 1/20th of that time.

Note that “10” is used as a nominal acceleration factor because any faster (higher factor) would mean a significantly higher budget which would be at risk of being cut and the entire budget could be deleted. Any smaller factor would be mean the solution would be available for less than 90% of the Event Cycle time and this would be considered getting more risk for the Event to occur than is satisfactory.
The Grand Challenge (GC) announcement came on July 18, 2013 and has this web reference:

The director of NASA’s Grand Challenge Program has stated that the smallest size Asteroid of concern would be 30 meters in diameter. This size asteroid impacts the Earth on average once every 100 years. Larger asteroids hit proportionally less frequently and smaller asteroids hit proportionally more frequently, but have much less impact due to their size and burning up in the Earth’s atmosphere.

If the ARM program or a similar program is not done, the GC program would have to be augmented by the technologies and capabilities necessary to perform asteroid orbit adjustments. This could double, triple or make much higher cost for the GC program.
If the Asteroid Redirect Mission is not done and there is no replacement, then the Grand Challenge Program will have to be increased to develop at least 3 methods of redirecting an asteroid. This could at least double the total GC cost to $600M and more likely triple the cost to $900M or much greater.

The total GC cost to consider includes the cost of finding all asteroids of 30 meters in diameter or larger that are considered Near Earth Orbit asteroids (NEOs), plus the cost of performing at least 3 asteroid orbit adjustments to test at least 3 methods of asteroid redirection. There would be continuing costs to maintain asteroid orbit determinations and find new NEOs that may appear in the future as well as testing new methods of asteroid deflection, however these continuing costs would not be figured into the Deep Risk solution since this solution is meant to cover the original problem and not a continuing situation.

The “Annual Budget” for this Deep Risk is considered an average for this case. A realistic budget profile in time would start small and ramp up to a maximum and then step down as the solution is achieved.
Summary

- More risks can be covered with a limited mitigation budget by:
  - Across the board cuts in all mitigation plans.
  - Scrubbing each mitigation plan for most efficient use of resources.
  - Considering reduced or delayed spending on far term timeframes.
  - Requesting more budget from the budget source.
- Unknown risks and far term risks can be found by an assumptions analysis.
- Priority list can be established with risk analysis metrics and Management / Stakeholder preferences.
- There are advisable metrics to judge risk handling progress and reports to Management.
- A special case referred to as “Deep Risk” pertains to long term, catastrophic risks that can be handled by throttling a full solution budget.

Mike Helton - Helton Associates
Follow up & Primary Reference

- Presentation at ASQ Section 509 Website:
  - (This and past presentations including Al Florence’s presentation of Feb. 26, 2013 on Risk Management)

- Contact information:
  - Email: mr.helton@verizon.net

- Primary Reference: Carnegie Mellon Un. Software Engineering Institute Continuous RSKM Guidebook
  (Primarily concerns fundamentals of Risk Management)

Additional Questions ??
Backup Slides & Supplementary Material

The following backup material consists of selected Metrics on Risk Management information and additional guidelines for effective Risk Management application.

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Some Previous Talks on RSKM

- Managing the Risks of Risk Management

- Risk Analysis and Management"

- Overview of the NIST Risk Management Framework (SP 800-37)
  - By Lance Kelso of the US DOI, ......................... 5/24/2011

- Risk and Issue Management
  - By Al Florence, MITRE, ................................... 2/26/2013

- Risk Management 102 – Advanced Considerations
  - By Mike Helton, Helton Associates, ..................... 7/23/2013

- Risk Management 103 – Metrics
  - By Mike Helton, Helton Associates, ..................... 9/23/2014
This is an example table of values to quantify the three attributes of a risk (Probability of occurrence, Impact, and Timeframe).

The values are in the left most column and the descriptions are in the right side columns. These values can be utilized in various ways to describe and track a risk as well as derive other metrics for trend analysis. For example, the Risk Exposure metric is found by the Probability value x the Impact value. (RE = P x I)

Note the impact can be in schedule, cost or performance or any combination of these. Typically, the impact of a risk is the worst case (highest value) of these three.

The description information shown in this table is only an example and should be replaced by information agreed to by management of a given project and typically documented in the project Risk Management Plan (RMP).
By choosing the correct metrics we can:

1. Discriminate different risks for level of importance to deal with.
2. Use resources most effectively.
3. Show trends to indicate progress of a given risk mitigation.
4. Assist management with Program or project priorities and other decisions.
5. Help answer the question: “Is this process working?”
6. Adapt the RSKM Process to a particular project or program.

Metrics that are chosen to work the RSKM Process must support one or more of these 6 objectives for RSKM.