Data-Driven Monetization of Acquisition Risk

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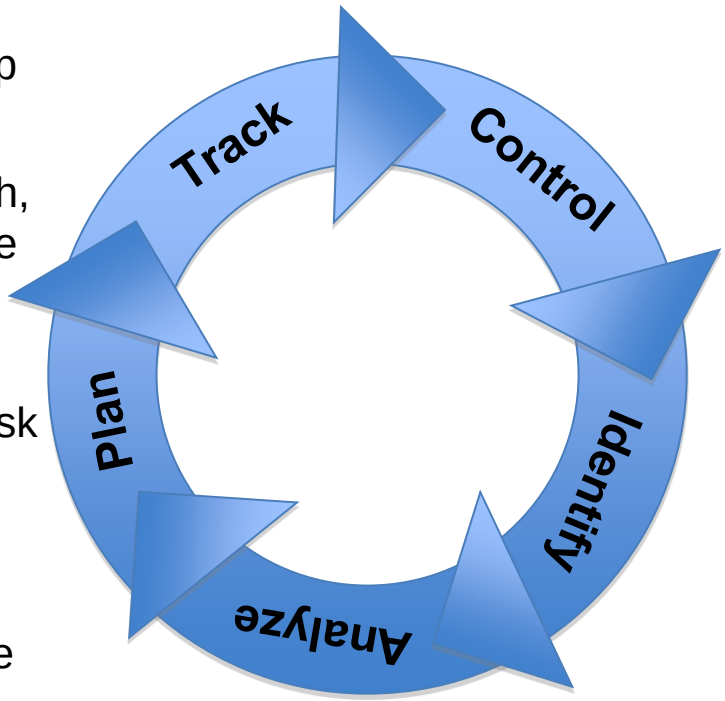
Summary Proposal

We propose a methodology that actively collects and continuously, quantitatively analyzes metrics that are earlier indicators of risk than cost and schedule slip. This methodology includes:

- **The application of web-based technologies to collection and analysis**
- **A quantified risk cloud and monetized risk thresholds**
- **Establishing a readily-accessible knowledge base of previous program failures**
- **New metrics to be collected closer to the source of risk**

Traditional Continuous Risk Management (CRM) Process for Acquisition

- **Identify:** State the risk in terms of condition and consequences; capture the context of the risk; e.g., what, when, where, how, and why.
- **Analyze:** Evaluate risk probability, impact/severity, and time-frame (when action needs to be taken); classify/group with similar/related risks; and prioritize.
- **Plan:** Assign responsibility, determine approach (research, accept, mitigate, or monitor); if risk will be mitigated, define mitigation level (e.g., action item list or more detailed task plan) and goal; execute plan.
- **Track:** Acquire/update, compile, analyze, and organize risk data; report tracking results; and verify and validate mitigation actions.
- **Control:** Analyze tracking results, decide how to proceed (re-plan, close the risk, invoke contingency plans, continue tracking); execute the control decisions.
- **Communication and documentation:** These are present in all of the preceding functions and are essential for the management of risks. A system for documentation and tracking of risk decisions shall be implemented.

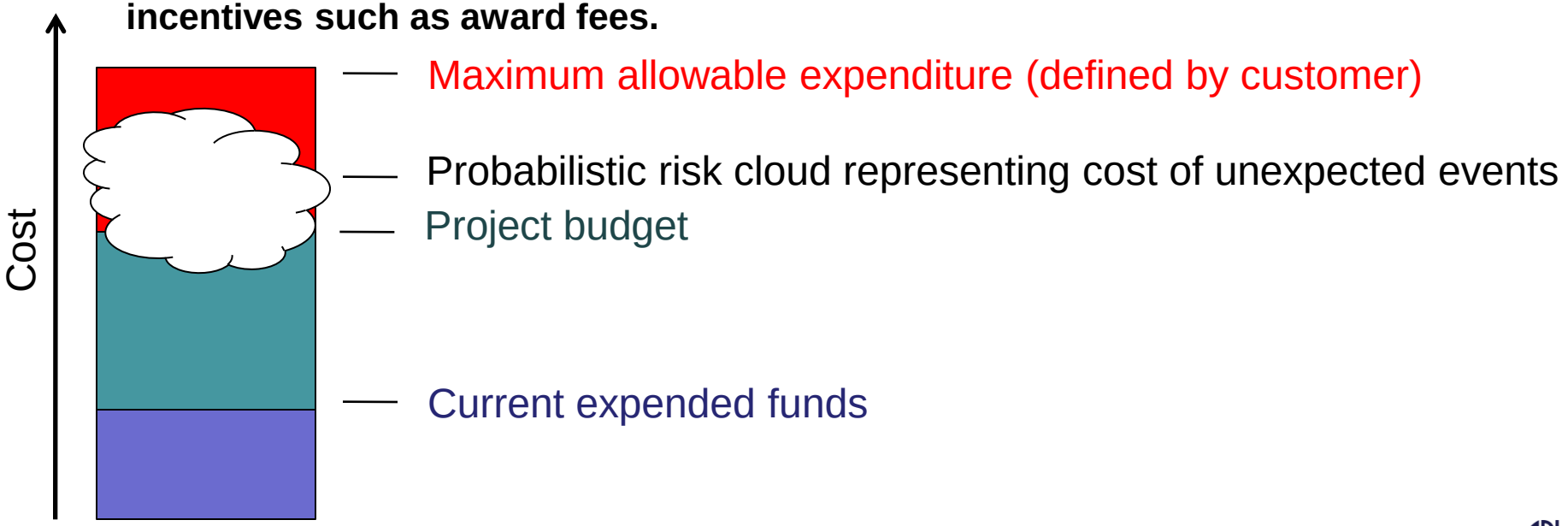


Observations About Existing Risk Assessment Approaches

- Team members tend toward optimism, consequently underestimating risk.
- Engineers often recognize technical and programmatic risks, but can't/won't risk raising concern for fear of retaliation.
  - Engineers are rarely included in risk assessment.
- All acquisition team members are limited by their collective knowledge of risk.
  - They can't be expected to know or recognize all the risks that have ever resulted in acquisition failures.
- Risks are usually assessed qualitatively rather than quantitatively because they lack the data to produce useful and realistic metrics.
- Methodologies that look at cost and schedule, e.g. EVMS, are assessing symptoms, not causes.
  - We need metrics that are causally closer to symptoms.
- The potential causal relationships between individual risks are often overlooked, i.e. a failure in one aspect of a program may have a cascade effect.

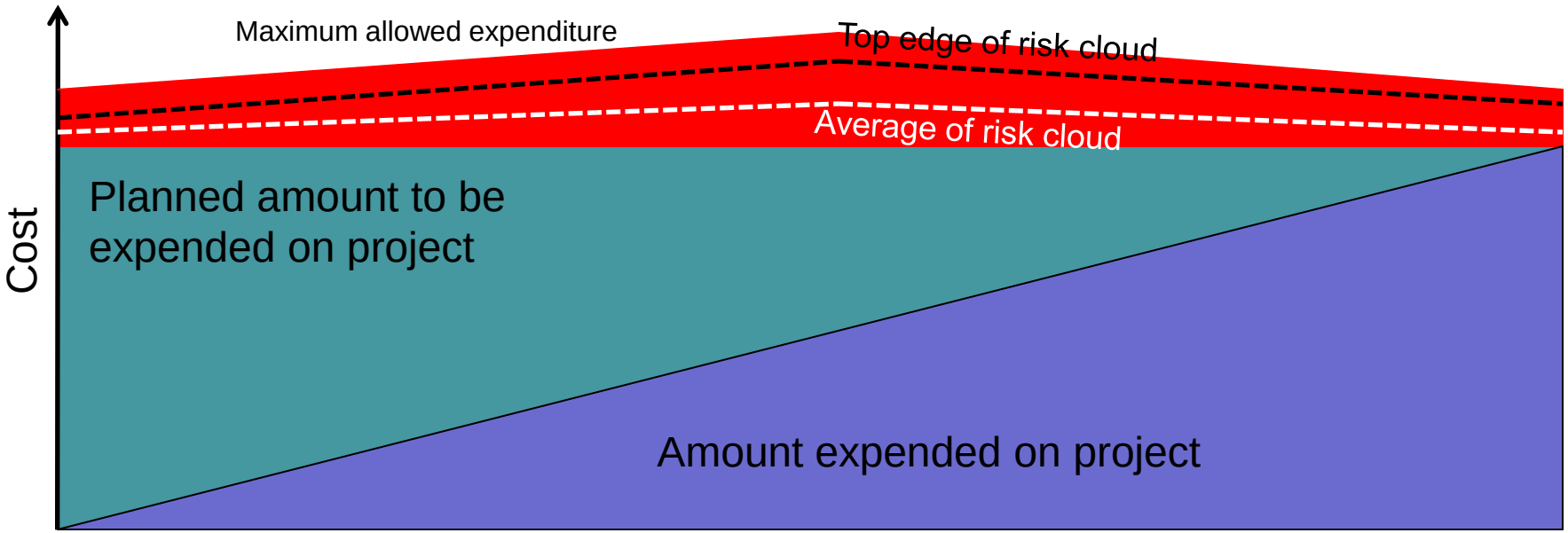
Proposed Risk Analysis Snapshot for Acquisition Project Cost Projection

- **By monetizing project risks, a probabilistic risk "cloud" can be calculated that permits understanding of the additional costs unexpected events will incur for the project.**
- **A well-managed project can sustain a set of unexpected events and stay within budget.**
- **A sponsor may justifiably terminate (or significantly reorganize) a project if an average of unexpected events will drive costs above the maximum allowable expenditure.**
  - **The performer might also set the maximum expenditure to prevent loss of incentives such as award fees.**



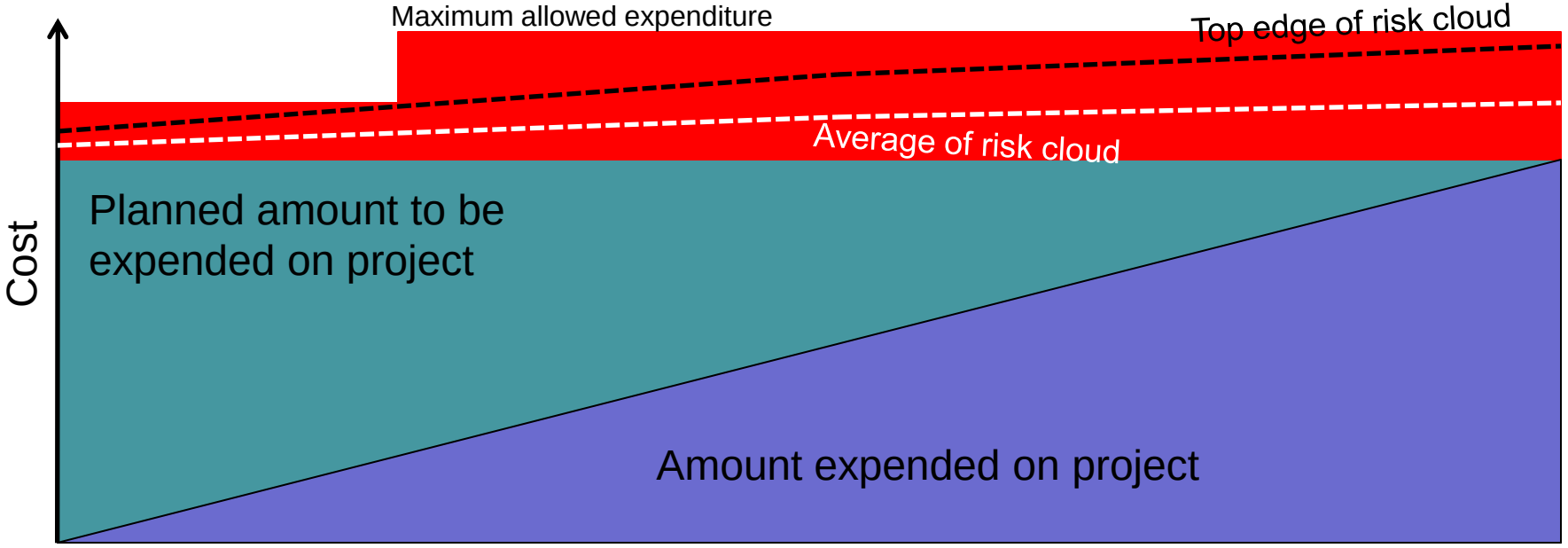
Proposed Risk Analysis for Acquisition Project Cost Projection Over the Acquisition Lifecycle

- **Risk level should be low at the beginning of the project since there is greater room to recover.**
- **A concept that needs to be better understood is where the knee of the curve exists, i.e. where to allow the greatest risk.**
  - **This may be related to the Technical Readiness Level (TRL) of the project.**



Project Scrub Decision Point

- **At any time, if the risk cloud is projected to cross the maximum allowed expenditure, there is a critical decision point:**
  - **Raise the maximum allowed expenditure or**
  - **Cancel or reorganize the program**



Recommendations for a "Living" Risk Management Capability

- **A *quantitative process* as previously described is only feasible with the support of *data* and the *infrastructure* to make it *usable* and *accessible* by programs.**

Quantitative Process

- Identify an initial set of discrete risk elements
- Monetize the identified set of discrete risk elements based on their negative impact to project resources multiplied against the likelihood of occurrence
- Determine the mathematics of unifying the monetized risk across the project by determining the causal relationships between the discrete risk elements
- Continually track, update, and plan against risks
- Compare their risks to a substantial knowledge base of risks from previous programs
- Collect metrics to support quantitative risk adjustments

Data

- Types of failures
- Indicators of failures
- Probability of failure based on indicators
- Loss percentages based on failures
- Applicable risk treatments (remedies) including success and failure metrics

Infrastructure

- **Knowledge base of individual risks searchable on multiple criteria, e.g. phase technical/programmatic, technologies, drivers**
- **Management tools for continually tracking, updating, and planning against risks**
- **Metrics collection tools**
- **Open APIs for importing and exporting data**

Usability

- **Portal features:**
  - **Present potential risks from which the risk assessor can choose, reducing the effort to "think up" all potential risks, but still allow the assessor to specify new risks.**
  - **Provide recommendations and guidance on techniques that apply to assessing individual risks**
  - **Integrate tools for collecting metrics including anonymous polling of team members**
- **Outputs:**
  - **Cloud of probable cost based on risk and comparison of the risk cloud**
  - **Tracking and adjustment of risk probabilities based on previous program performance.**
  - **Versioning and tracking to enable rapid assessment of risk management success over time**

Accessibility

- **Role-based access control for:**
  - **Management**
  - **Engineers**
  - **Government program managers**
  - **Auditors**
  - **Portal maintenance staff**

Deploying and Employing the Portal

- **While the application of this tool is technically outside the scope of our effort to improve the process of monetizing risk, the broad adoption of the proposed process and tool could factor into contracts in the form of specified government remedies, e.g. cancellation or re-bid, tied to specific risk metrics.**

Some Proposed (and Potentially Unpopular) Risk Metrics (1 of 2)

- **Work to noise ratio = work / (work + noise)**
  - **What percentage of time do engineers spend actually performing engineering tasks vs engaging in non-productive tasks, e.g. sitting in meetings/telecons to which they're not contributing nor from which they're getting actionable information?**
  - **This metric can be collected anonymously through the proposed web portal.**
- **Task coupling**
  - **To what degree does completion of tasks depend on coordination between tasks?**
  - **This metric is related to a Gantt chart of the schedule, but can't be seen on the Gantt chart.**
  - **Task coupling not only runs the risk of making both tasks late because they're interdependent, but simply trying to arrange the coordination often delays the tasks because schedules are hard to synchronize.**

Some Proposed (and Potentially Unpopular) Risk Metrics (2 of 2)

- **Resource gapping**
  - **A delay in one task delays a dependent task, causing a gap in tasking for some resources.**
    - **This could be observed as resource underutilization in the schedule.**
  - **Unlike machinery, engineers can't just sit idle; they have to be retained and paid, so they have to perform work.**
    - **It must be value-adding or the costs are wasted.**
    - **They can't be shifted to other, productive tasks because other resources have already been allocated, and putting them on other programs risks losing them and their expertise altogether.**
- **Engineering skill loss**
  - **Not just the loss of engineers, but the loss of the most knowledgeable and skilled engineers.**
  - **Engineers are not interchangeable parts.**
    - **When rumors of cuts start, the better engineers find new jobs and leave.**
    - **The loss of engineering skill is disproportionally larger than the loss of engineers.**
- **Energy drains**
  - **Individuals who have psychological and substantive negative impacts on otherwise productive members of the team**

DATA!

- **We can't switch from qualitative analysis to quantitative analysis without quantitative data.**
- **Central to the success of this approach is the collection and maintenance of data on previous acquisition risks and failures.**
- **New metrics should be solicited from the community.**
  - **Acceptable values for some of the new metrics and their impact on risk, e.g. work to noise ratio, cannot be determined without data collection from multiple programs.**
- **This type of community effort succeeds and thrives when the community continuously rates the value of the elements of the enterprise.**
  - **In this case, the applicability of identified risks and the accuracy of their associated metrics should be continuously evaluated and adjusted based on community feedback, improving accuracy over time.**

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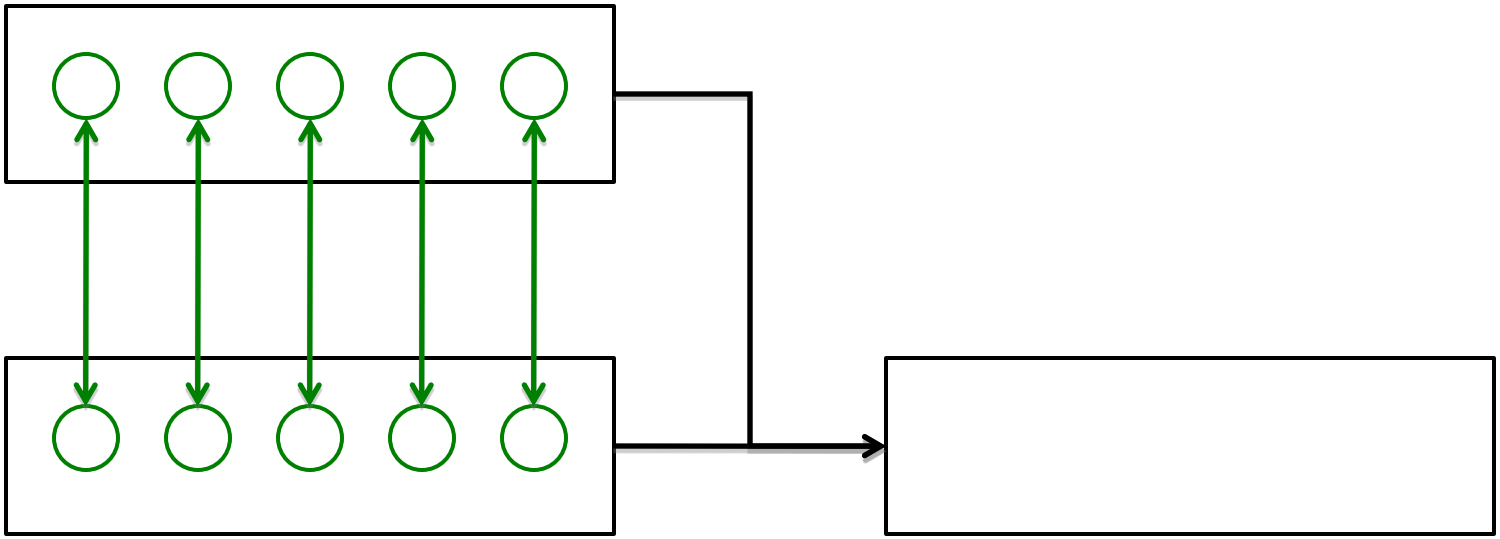
BACKUPS

Graphics

Objective

- **Improve the process of understanding and evaluating risk within acquisition projects to:**
  - **Reduce project failures, cost and schedule overruns, and unanticipated technical and managerial roadblocks**
  - **Better anticipate the full project undertaking**
  - **Prevent repeating historical lessons learned**
  - **Provide a more accurate risk analysis to existing projects to have a clearer understanding of its areas of predictability and unpredictability**

Task Coupling



Resource Gapping