Assuring Mission Success in Complex Settings

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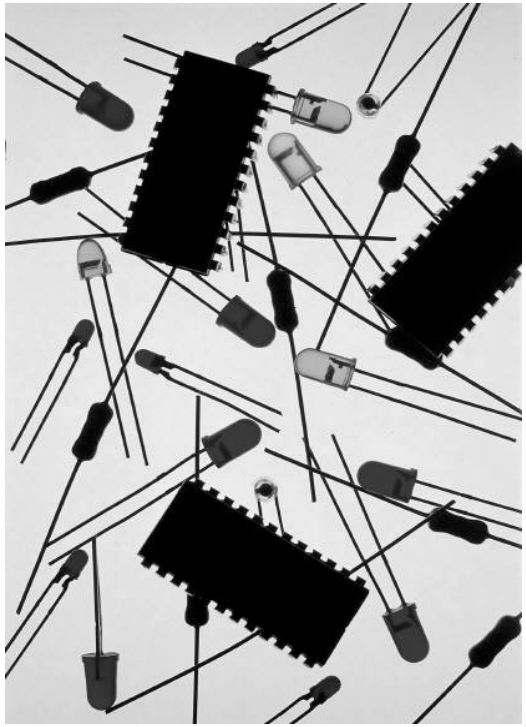
Managing Complexity

Managers are responsible for overseeing increasingly complex projects, programs, and operational processes.

- **Multiple points of management control**
- **Complex tasks**
- **Complex, distributed support technologies**
- **Multiple, detailed status reports**
- **A variety of management techniques (project, security, financial, technology, etc.)**
- **Requirements of multiple stakeholders**

Need for a New Approach



Traditional analysis and management approaches not designed for complex environments

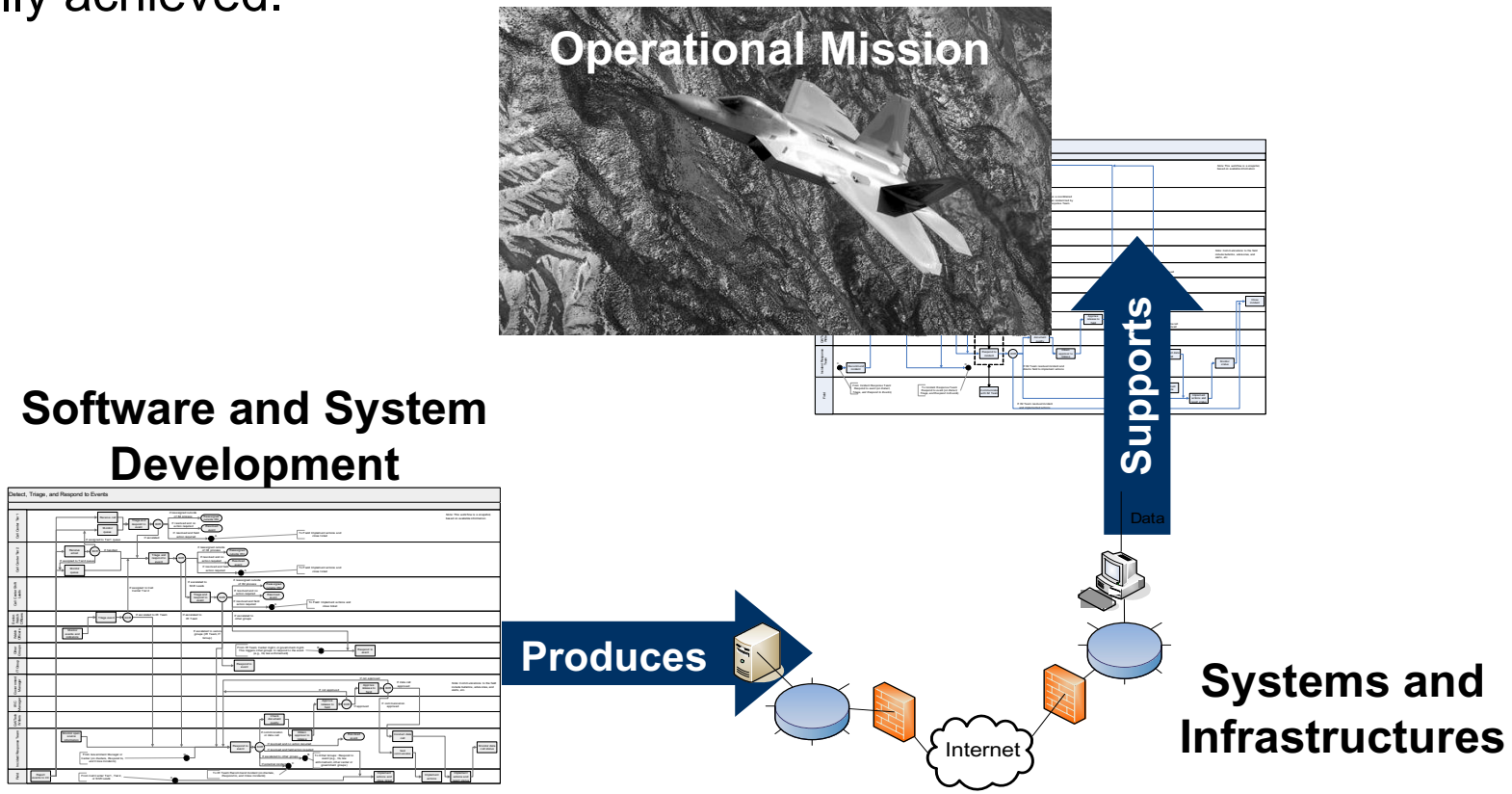
- **Cannot handle organizational and technological complexity**
- **Do not easily scale to distributed environments**

Need new methods, tools, and techniques to

- **Position projects, programs, and processes for success**
- **Establish and maintain confidence in achieving objectives**

Managing for Mission Success

Managing for mission success requires establishing and maintaining a reasonable degree of confidence that a mission's objectives will be successfully achieved.



SEI MOSAIC:
Managing for Success

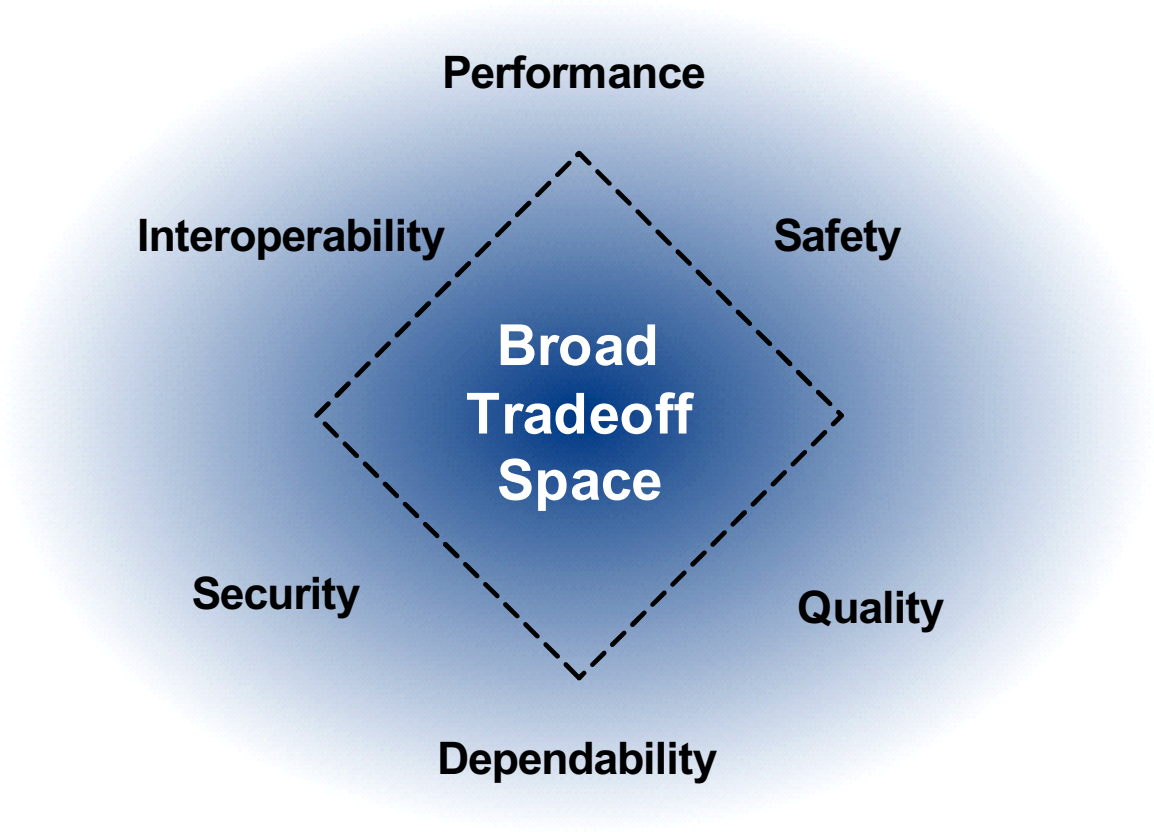
Overview

SEI Mission-Oriented Success Analysis and Improvement Criteria (MOSAIC) is a structured decision-making approach that

- **Establishes a reasonable degree of confidence in the potential for a successful mission**
- **Helps ensure mission success in projects, programs, processes, and systems**

Strategic Allocation of Resources

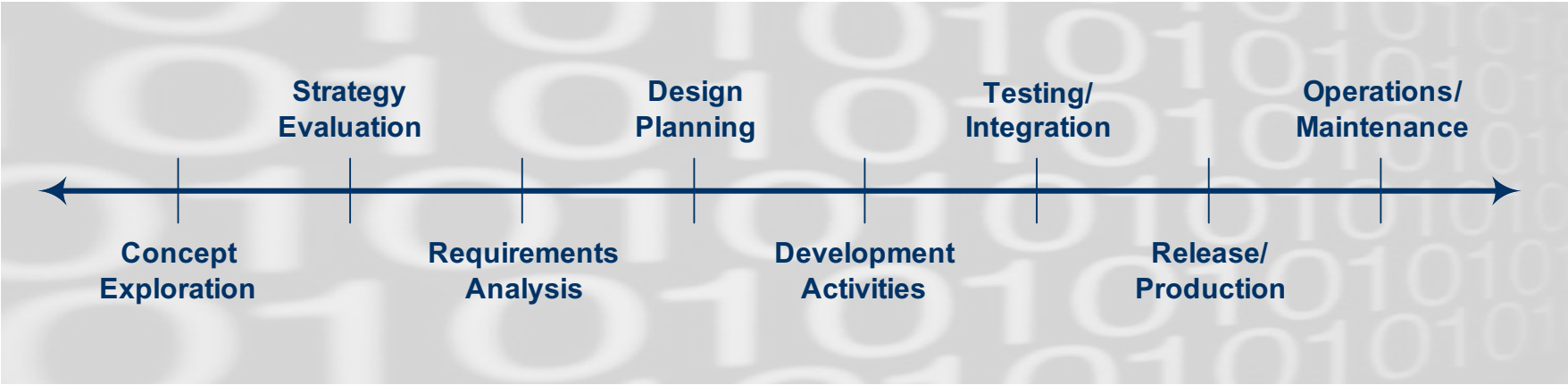
People need a way to make appropriate tradeoffs among a broad range of factors.



SEI MOSAIC: A Lifecycle Approach

Perform during any lifecycle phase

Supports most system lifecycle models



Managing the Outcome

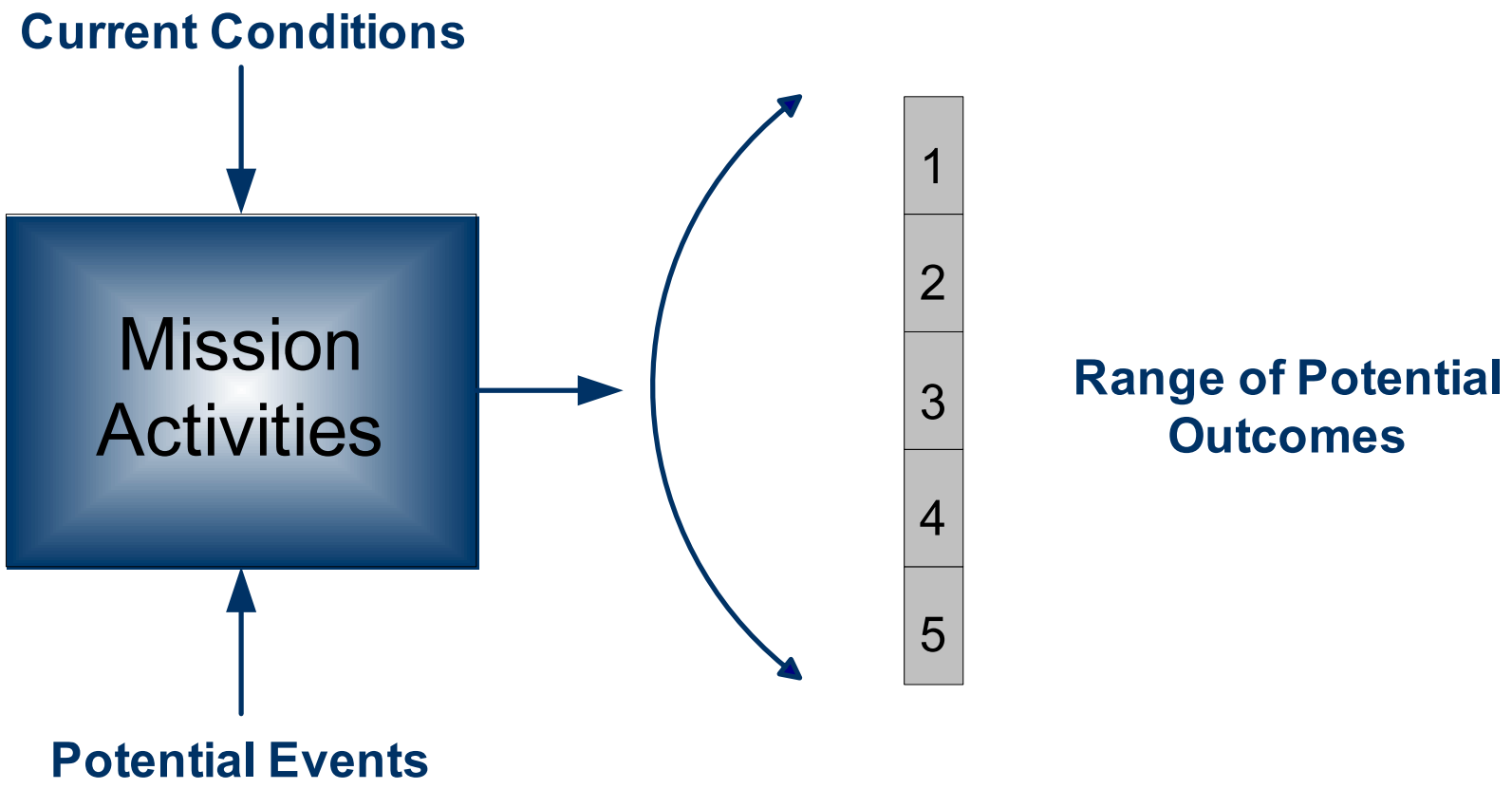
An outcome is the result achieved when executing a mission.

- **A range of potential outcomes is possible**
- **Some outcomes are acceptable—success**
- **Some outcomes are unacceptable—failure**

SEI MOSAIC defines an approach for managing the expected outcome in relation to the desired outcome.

- **What is the mission likely to achieve?**
- **What do I want the mission to achieve?**

Range of Potential Outcomes



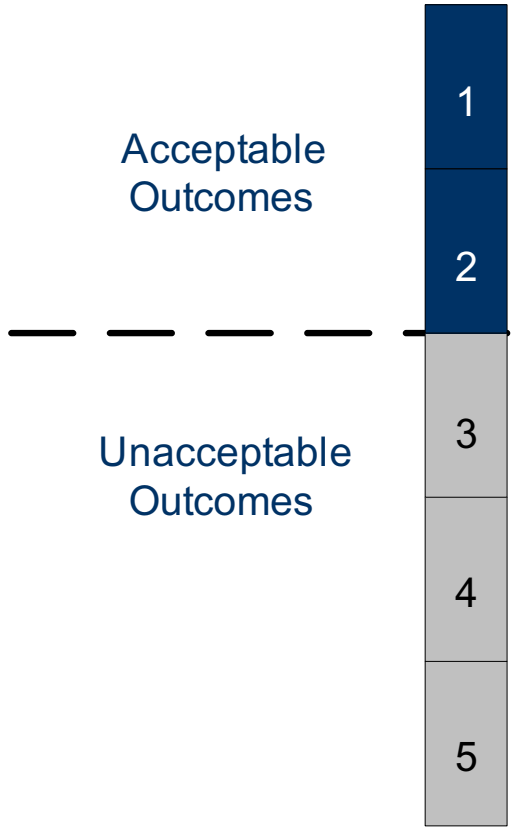
Positioning for Success

A range of outcomes is possible for any given mission.

Conditions and potential events

- **affect mission execution and influence a mission's eventual outcome**
- **must be appropriately managed to position a mission for success**

The objective is to drive the expected outcome toward acceptable states.



Unique Features of SEI MOSAIC

Traditional Risk Management	SEI MOSAIC
Narrow scope (single project, system, or organization)	Broad scope (distributed processes, systems of systems)
Linear view of risk (cause-effect pairs)	Interrelated view of risk
Threat-driven	Outcome-driven
Hazard avoidance	Opportunity seeking
"Playing not to lose"	"Playing to win"

SEI MOSAIC Project

Characteristics of Current Approaches

A prevalence of one-size-fits-all analysis and management methods

- **Complex solutions that are not easily tailored (especially to small organizations)**
- **Tied to specific domains or problems**

Locally optimized results

- **Narrow tradeoff space**
- **Subset of the lifecycle**
- **Narrow scope (e.g., single project, system, or organization)**

SEI MOSAIC Approach

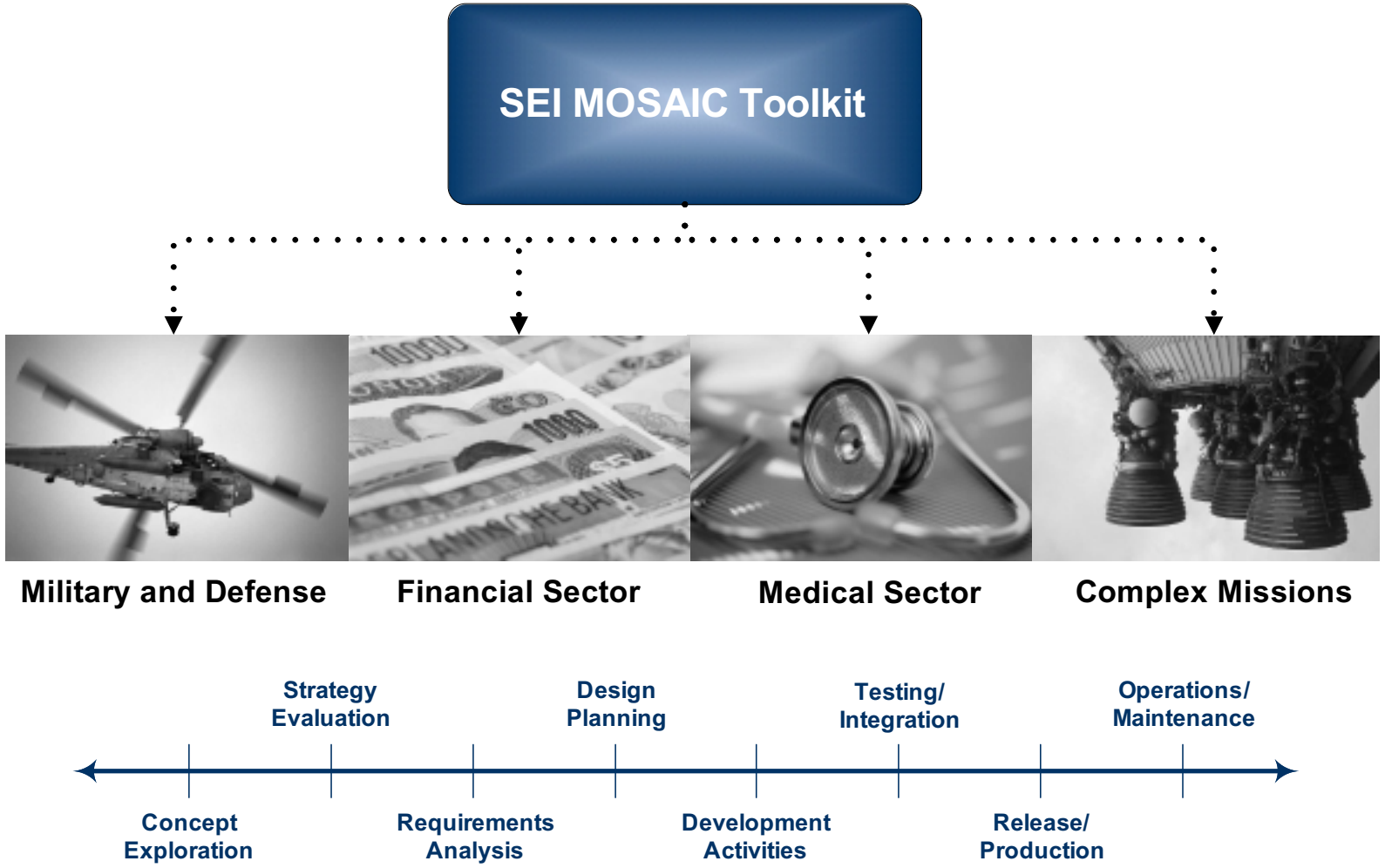
Each SEI MOSAIC method is tailored to

- **A given situation, problem space, or lifecycle phase**
- **The domain or application area**
- **The circumstances at hand**

SEI MOSAIC is focused on global effectiveness and mission success.

- **Broad tradeoff space**
- **Lifecycle focus (development and operations)**
- **Broad scope (e.g., distributed processes, supply chains, systems of systems)**

SEI MOSAIC Toolkit



SEI MOSAIC Methods

Our current work is focused on developing a suite of analysis methods.

Two methods so far:

- **Mission Diagnostic is a basic approach that provides a quick, high-level evaluation.**
- **Mission Assurance Analysis Protocol (MAAP) is a comprehensive approach that provides an in-depth evaluation.**

Mission Diagnostic

What
A time-efficient means of assessing the potential for success

Why
To determine whether conditions are favorable for a successful outcome

Key Results
An evaluation of key indicators and an estimate of the success potential

Key Indicators

Evaluate a set of indicators representing key aspects of management, for example:

- **Realistic goals**
- **Customer requirements**
- **Staffing requirements**
- **Technology feasibility**
- **Plans and schedules**

"Are customer requirements and needs well understood?"

Evaluating Key Indicators

Question	Answer				
	No	**Likely no**	**Equally likely**	**Likely yes**	**Yes**
1. Are goals realistic and well articulated?	q	q	q	n	q

Each indicator is evaluated based on the data that have been collected.

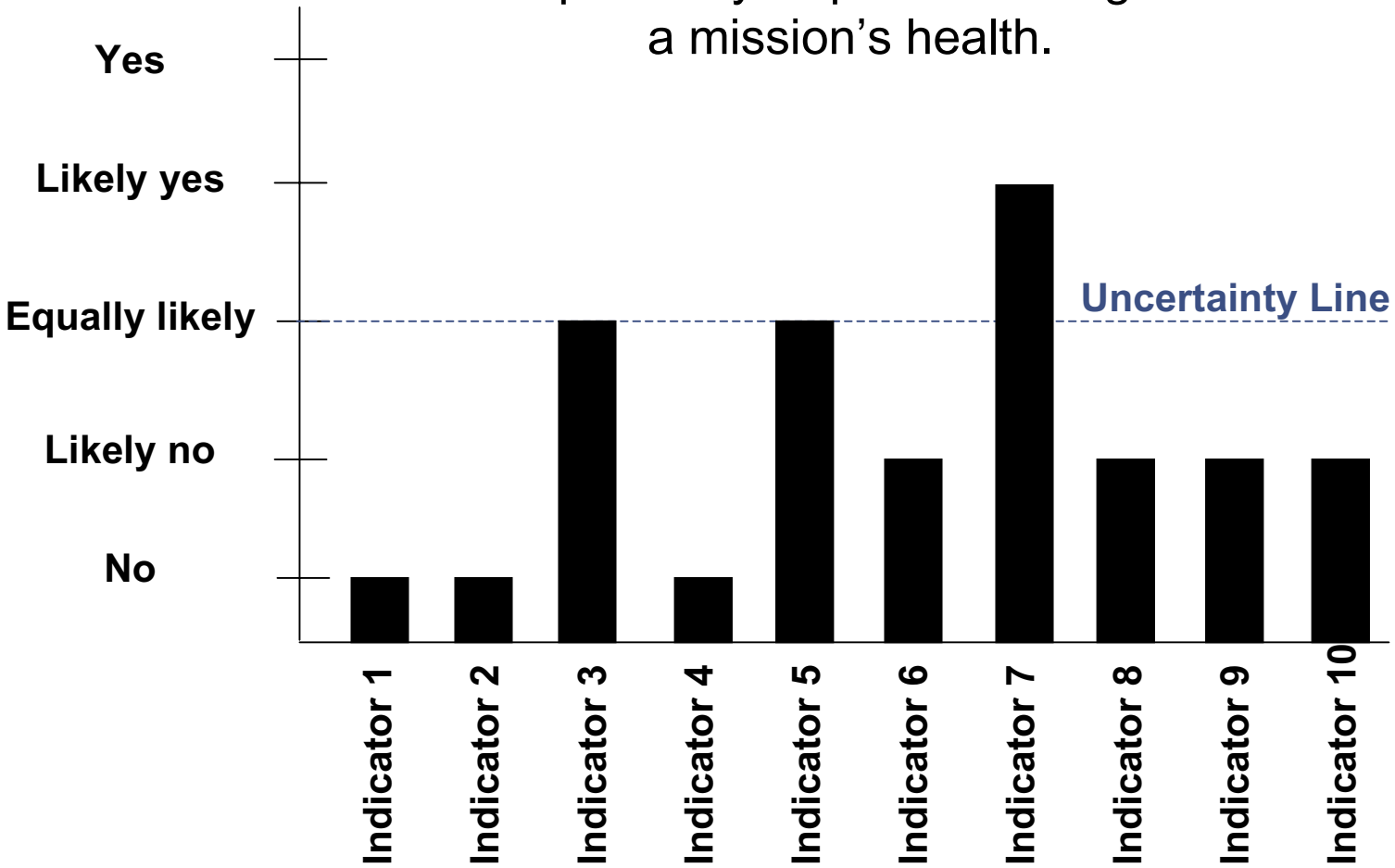
Uncertainty is incorporated into the range of answers for each indicator.

Indicator Evaluation Criteria

Answer	Definition
Yes	The answer is almost certainly "yes." Very little uncertainty exists.
Likely yes	The answer is most likely "yes." However, a degree of uncertainty exists.
Equally likely	The answer is just as likely to be "yes" or "no." A high degree of uncertainty exists.
Likely no	The answer is most likely "no." However, a degree of uncertainty exists.
No	The answer is almost certainly "no." Very little uncertainty exists.

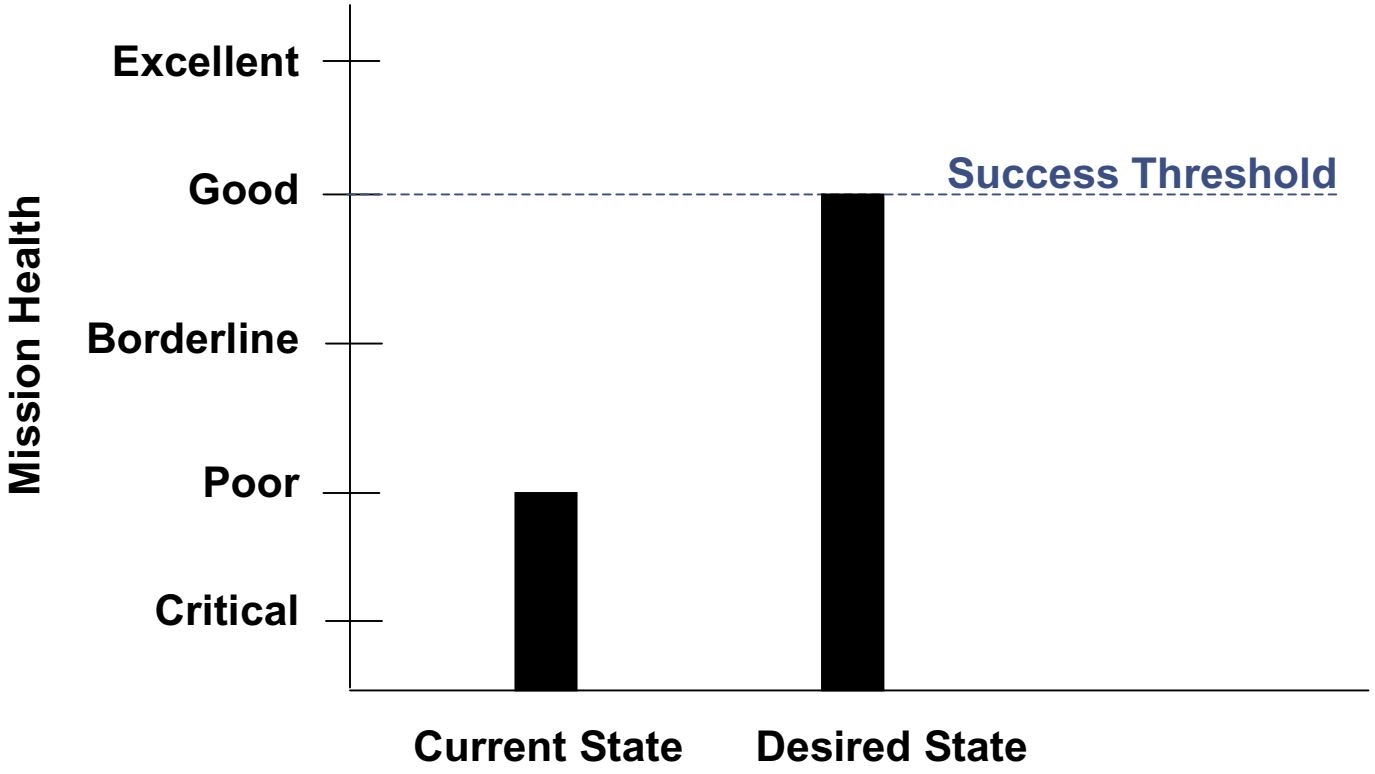
Indicator Analysis

A simple analysis provides insight into a mission's health.



Managing the Potential for Success

The goal is to improve a mission's current state of health.



Indicators for Software Development Programs

- Are goals realistic and well articulated?
- Are communication and information sharing about mission activities effective?
- Are customer requirements and needs well understood?
- Are stakeholder politics or other external pressures minimal?
- Does the process design support efficient and effective execution?
- Are process control mechanisms are effective?
- Is task execution efficient and effective?
- Are staffing and funding sufficient to execute all mission activities?
- Are the technological and physical infrastructures adequate to support all mission activities?
- Are changing circumstances and unpredictable events effectively managed?

Evaluating Indicators

The following data are recorded for each indicator:

- **Indicator score**
- **Rationale for indicator score**
- **Analysis approach (for example, intuition, qualitative analysis, quantitative analysis, other)**
- **Potential actions**
- **Evaluators**
- **Date**

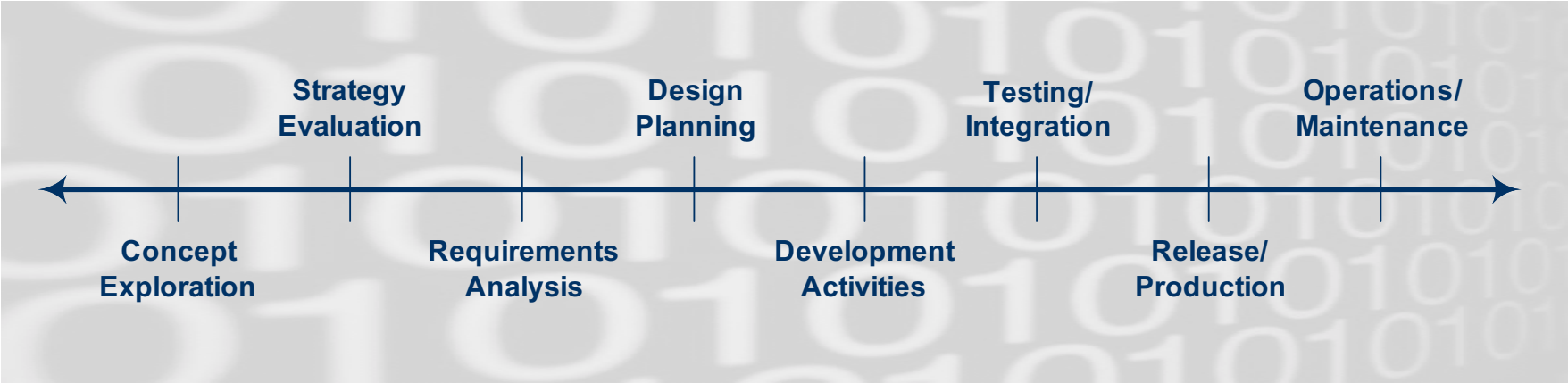
Mission Diagnostic Exercise and Handout

Tailoring Questions

The following questions can be used when tailoring or developing a set of indicators:

- **What constitutes a successful result for the project or process?**
- **What constitutes an unsuccessful result, or failure, for the project or process?**
- **What circumstances or conditions tend to produce a successful outcome when conducting the project or process?**
- **What circumstances or conditions tend to produce an unsuccessful outcome, or failure, when conducting the project or process?**

Mission Diagnostic Across the Lifecycle



How much uncertainty in these indicators can you tolerate at different points in the lifecycle?

MAAP

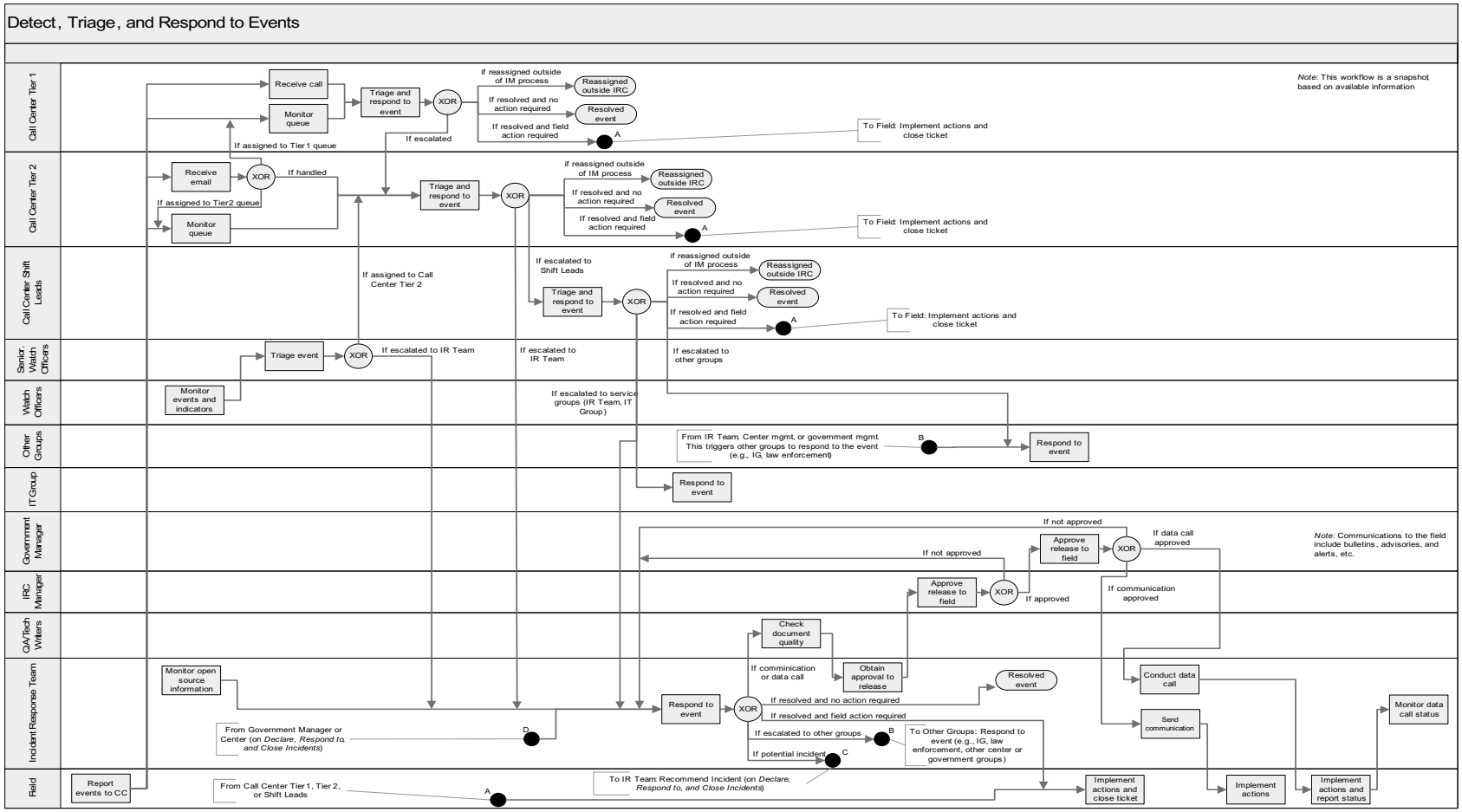
What
A systematic approach for thoroughly analyzing the potential for success

Why
To characterize the full range of drivers affecting the success potential

To set management priorities to ensure the success potential is maintained within tolerance

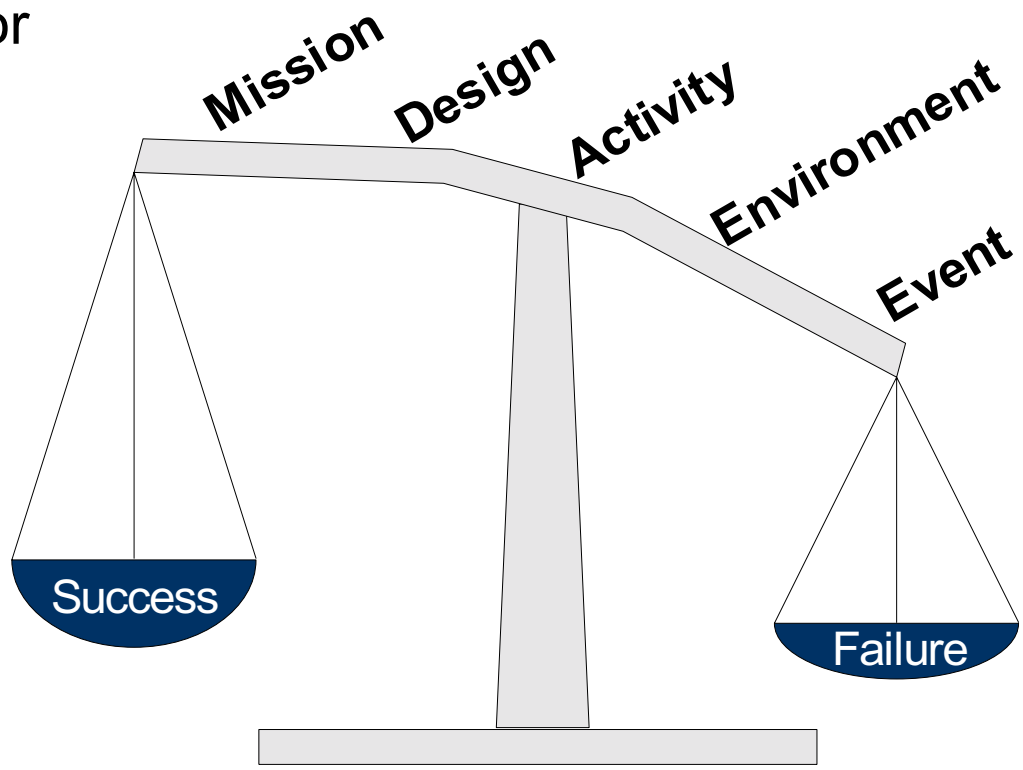
Key Results
An operational model, customized analysis artifacts, a measure of the success potential, and strategies for keeping the success potential within tolerance

Operational Model of Mission Activities



Drivers of Success and Failure

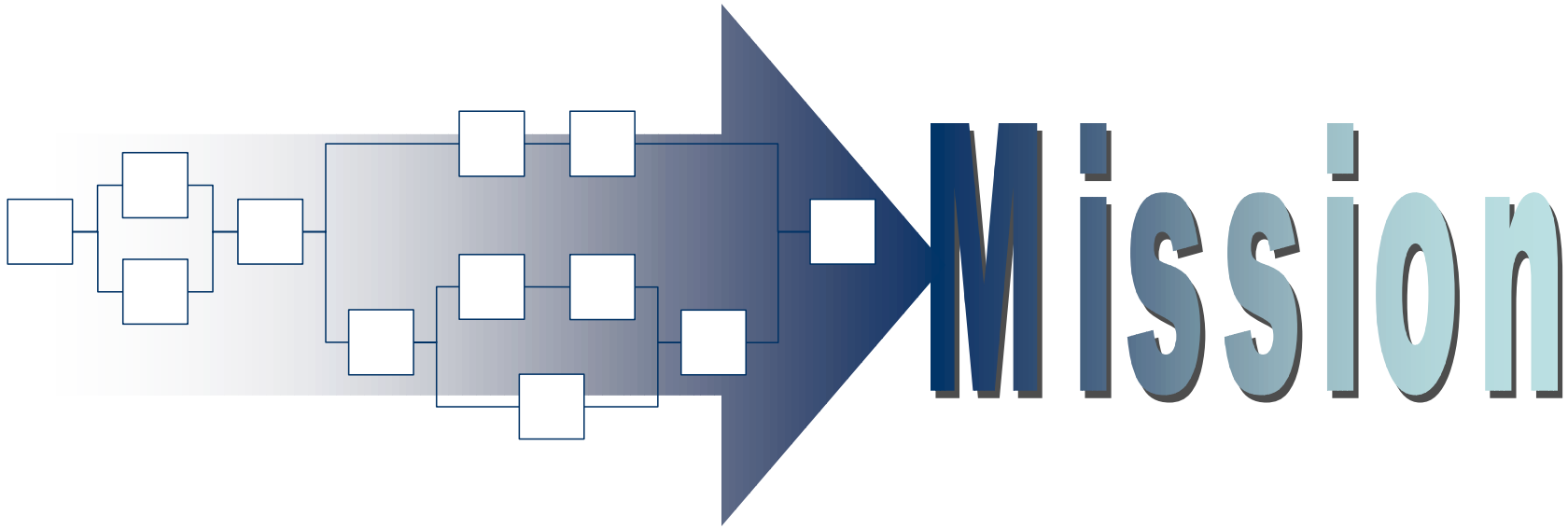
A broad range of drivers must be considered when analyzing the potential for mission success.



Mission

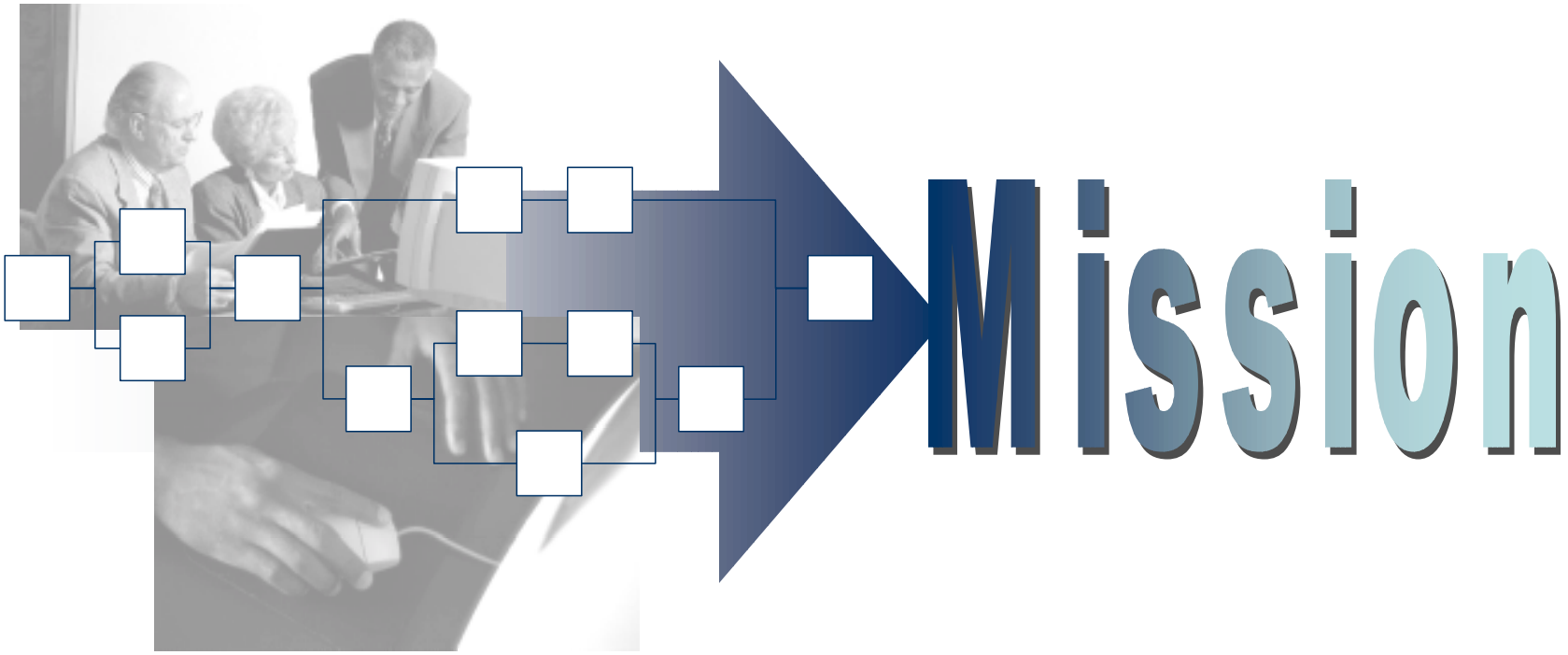
A **mission threat** is a fundamental flaw, or weaknesses, in the purpose and scope of a work process.

Process Design



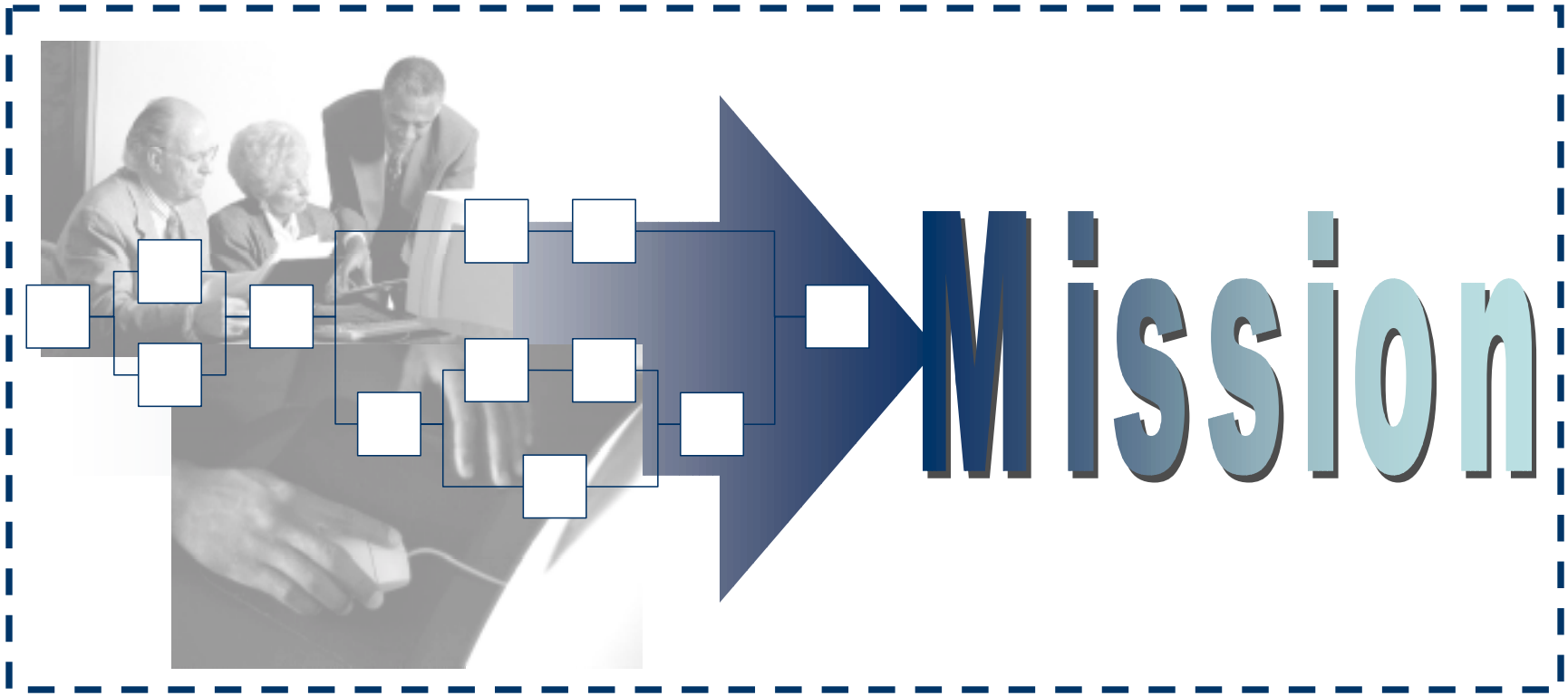
A **design threat** is an inherent weakness in the layout of a work process.

Activity Management



An **activity threat** is a flaw, or weaknesses, arising from the manner in which activities are managed and performed.

Operational Environment

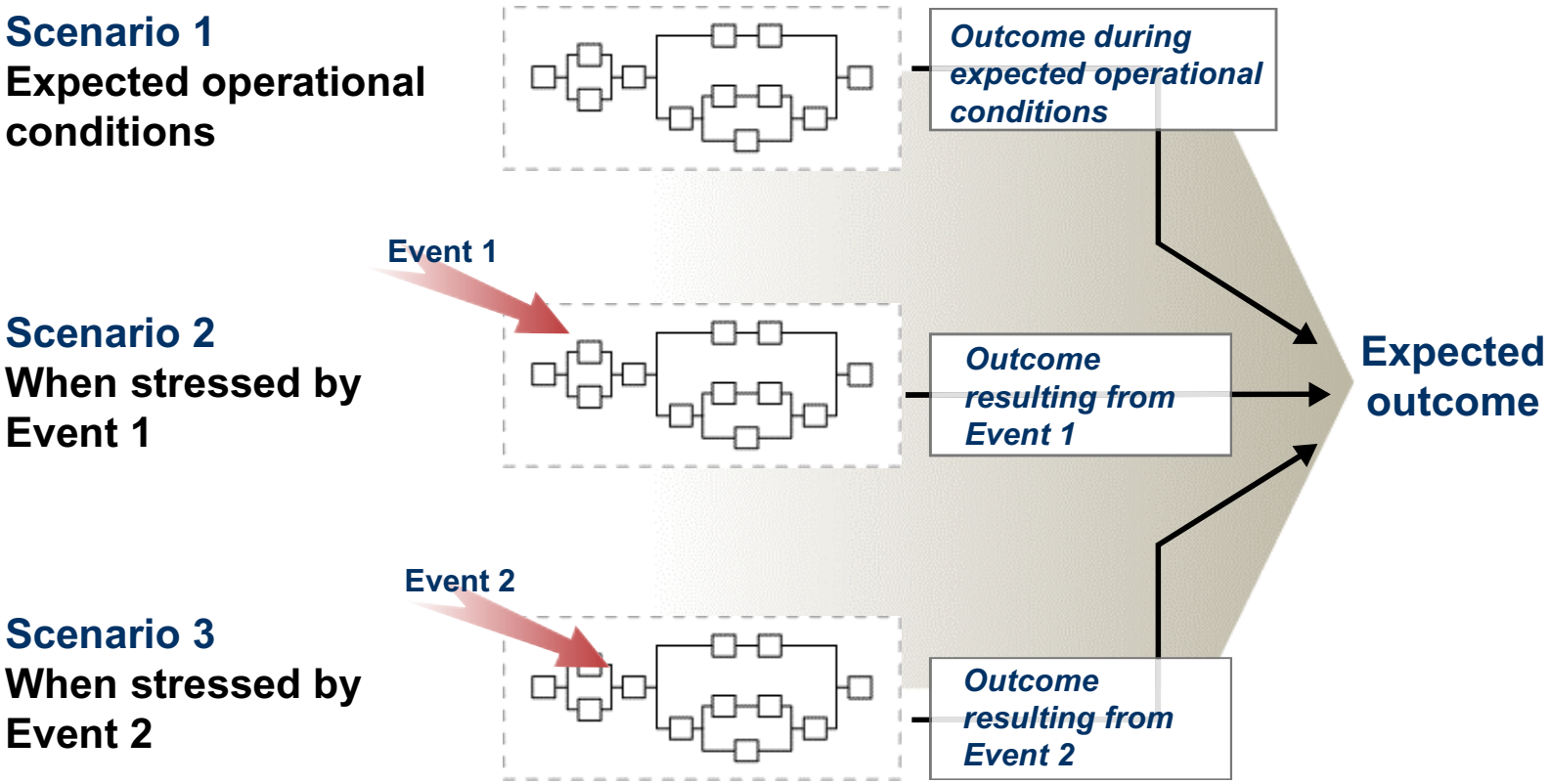


An **environment threat** is an inherent constraint, weakness, or flaw in the overarching operational environment in which a process is conducted.

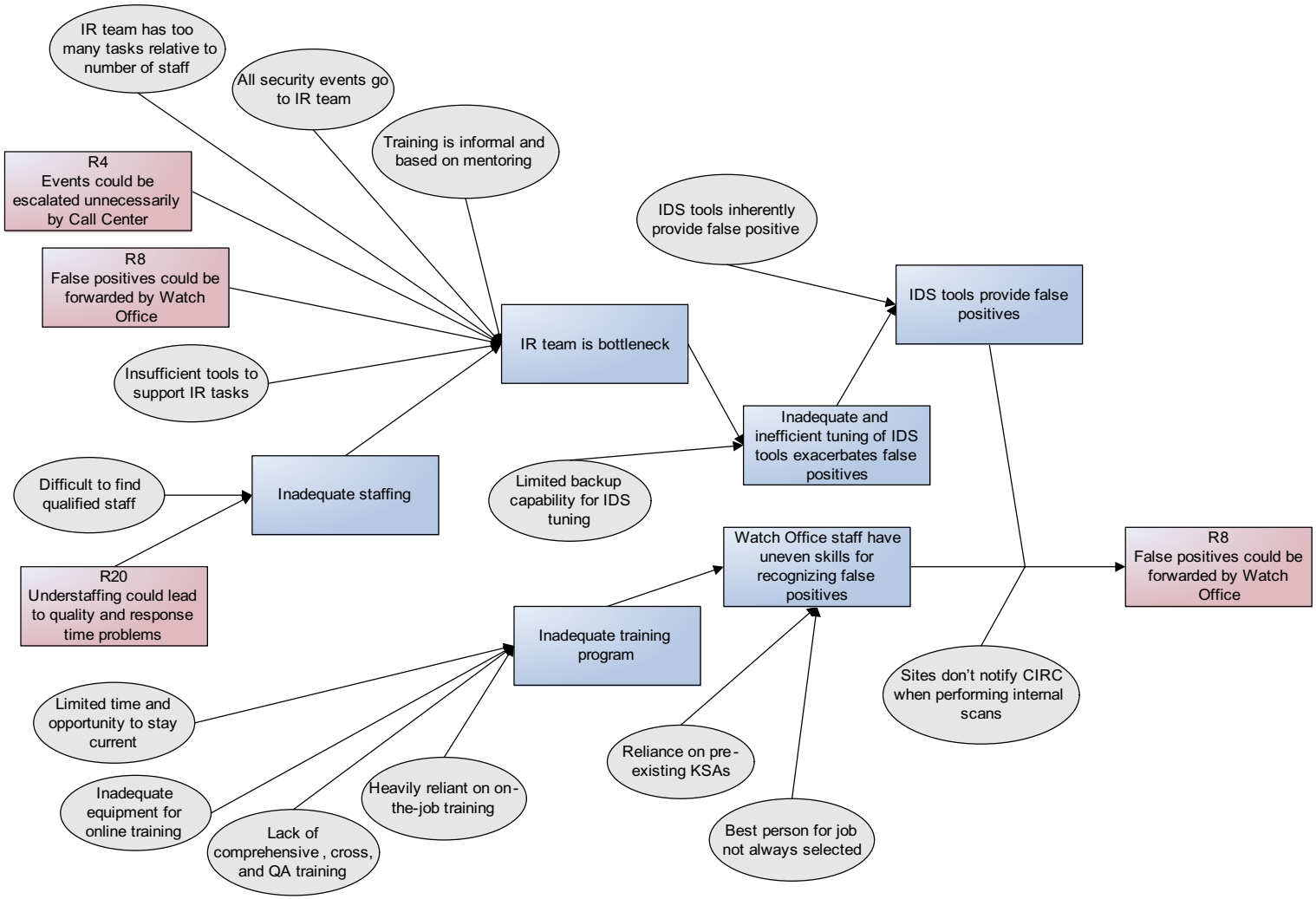
Event Management

An **event threat** is a set of circumstances triggered by an unpredictable occurrence that introduces unexpected change into a process.

Scenario-Based Analysis

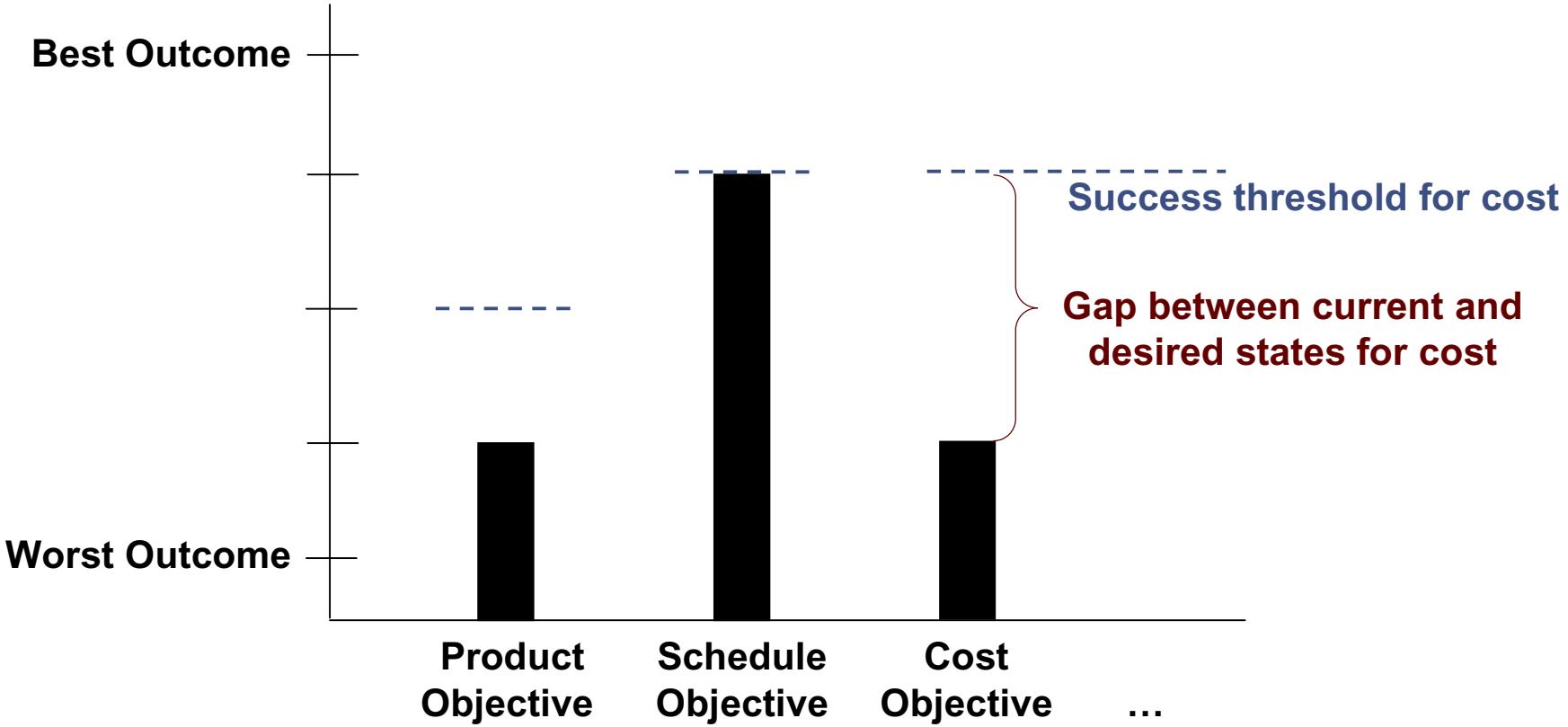


Complex Risks



Outcome Analysis

The goal is to ensure that the expected outcome for each objective in all evaluated scenarios is acceptable to key stakeholders.



Unique Features of SEI MOSAIC

- Manages the potential for success
- Can be applied to highly distributed programs and operational processes
- Provides a ‘global’ view of a mission
- Analyzes issues that are too complex for other techniques

Potential Application Areas

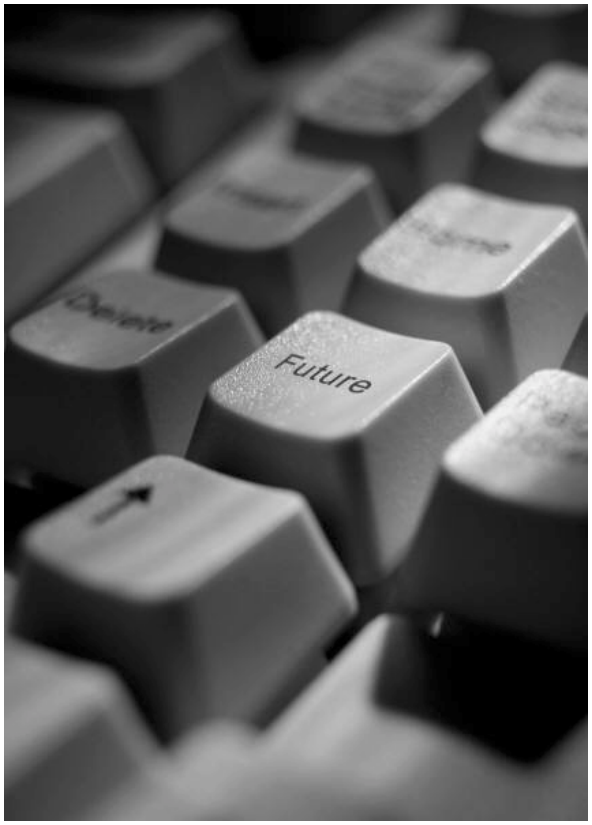
- Large, distributed software development programs
- Organizations in dynamic, rapidly changing business environments
- Organizations with strict reliability, security, and safety requirements
- Large, distributed supply chains
- Processes supporting critical infrastructures
- Distributed information-technology (IT) processes

Future Research and Development

Refine the current SEI MOSAIC analysis protocols.

Define and pilot additional SEI MOSAIC analysis protocols.

Begin work on an approach for real-time monitoring and management of mission outcomes.



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