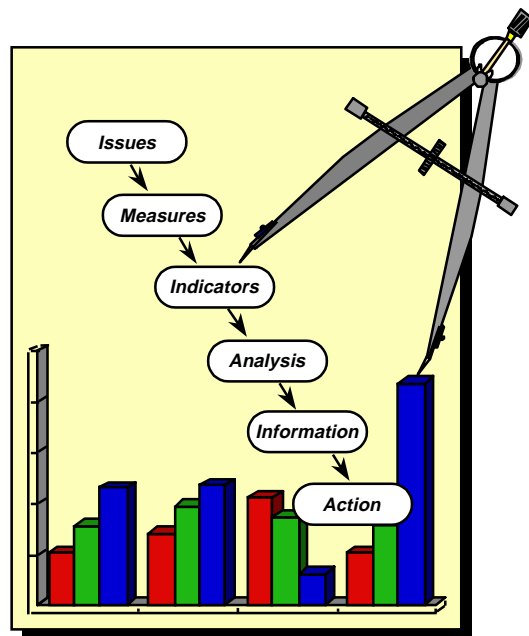


Practical Software Measurement

A guide to objective program insight



PSM Guidance Planning and Feedback

July 23, 1997

***Joint Logistics Commanders
Joint Group on Systems Engineering***

***Office of the Under Secretary of Defense
Acquisition and Technology***

Workshop Objectives

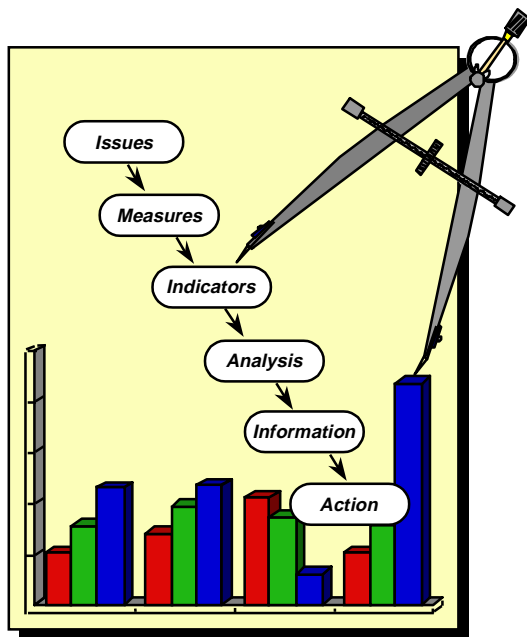
- ***Review the PSM Version 3.0 Guidance***
- ***Identify Additional User Requirements To be Addressed in PSM Version 3.0***
- ***Assess Current PSM Guidance and Associated Products - Identify Required Revisions***
- ***Review the Current PSM Project Plan***

Workshop Agenda

- ***8:30 - 10:00 PSM Version 3.0 Summary***
- ***10:00 - 10:30 Break***
- ***10:30 - 12:00 Technical Discussion***
- ***12:00 - 1:00 Lunch***
- ***1:00 - 3:00 Technical Discussion***
- ***3:00 - 7:00 Free Time***
- ***7:00 - 9:00 Prepare Summary Briefing***

Practical Software Measurement

A guide to objective program insight



Version 3.0 Revisions

July 22, 1997

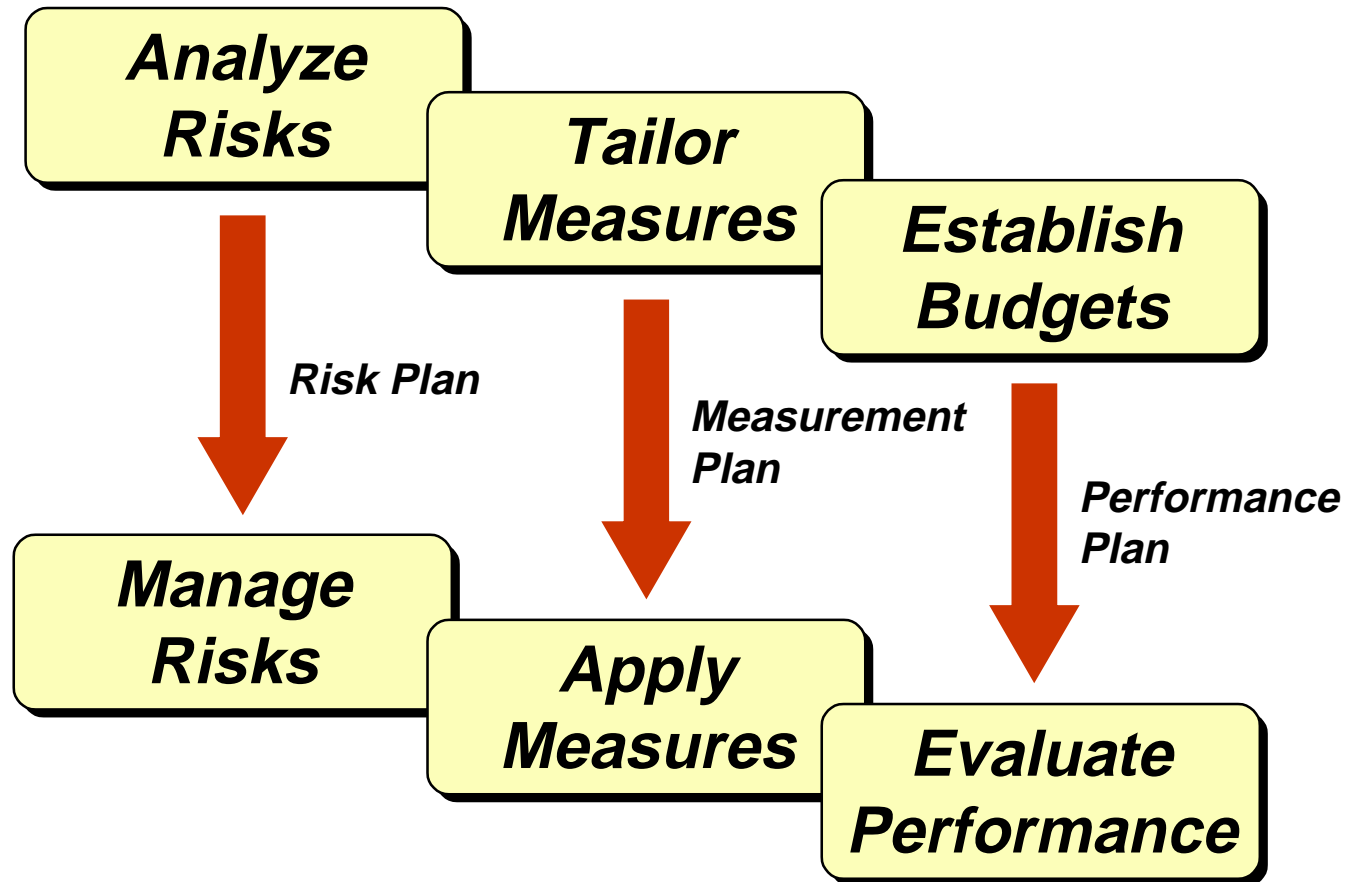
***Joint Logistics Commanders
Joint Group on Systems Engineering***

***Office of the Under Secretary of Defense
Acquisition and Technology***

PSM Version 3.0 Objectives

- ***Directly Integrate Measurement With Other Software Management Disciplines***
- ***Expand Quantitative Software Analysis Guidance***
- ***Provide Additional Measurement Guidance for Software Maintenance***
- ***Update Existing PSM Guidance***

Quantitative Software Management

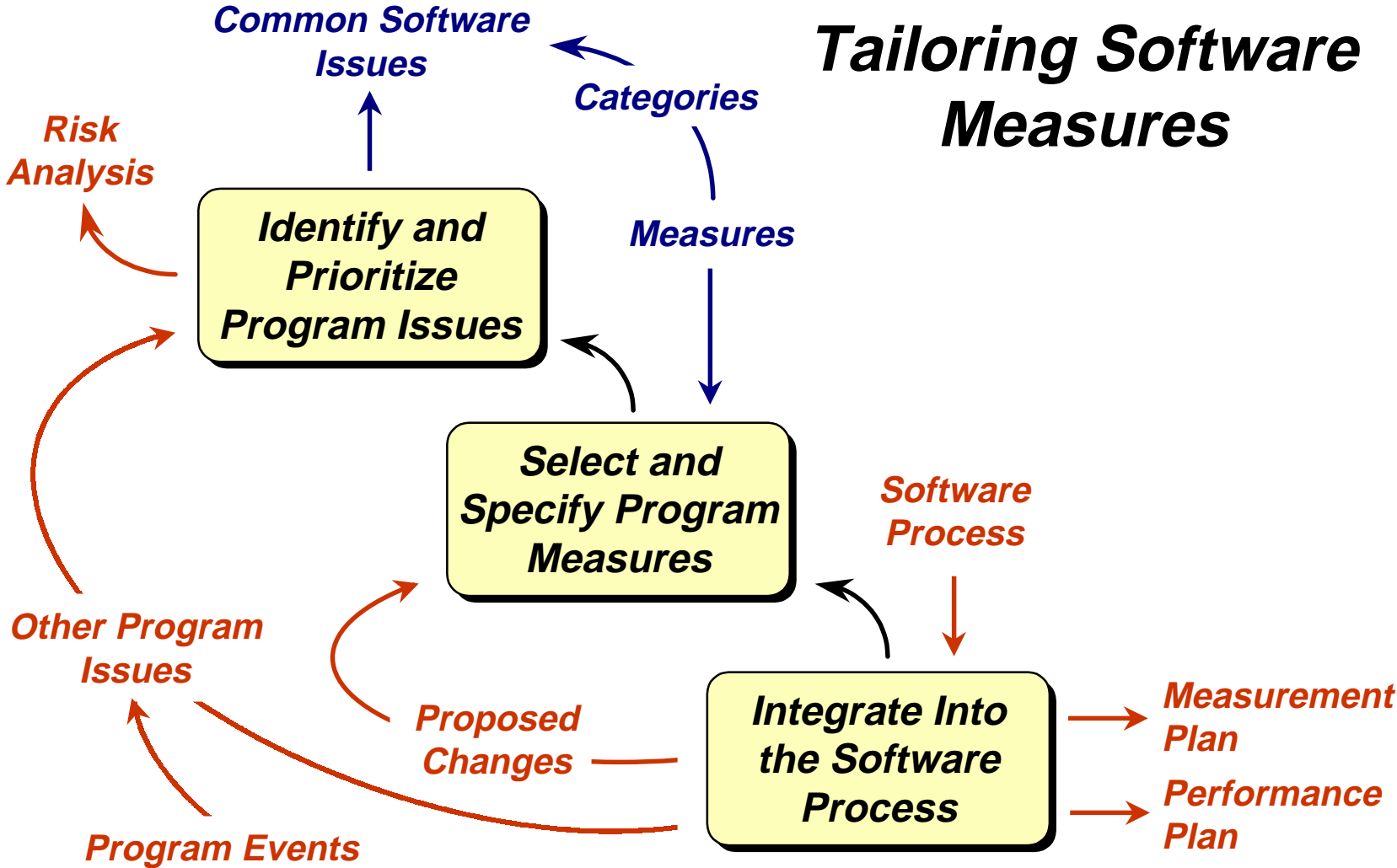


PSM Version 3.0 Additions and Revisions

- ***Measurement Process Revisions***
- ***Risk Management Integration***
- ***Performance Measurement Integration***
- ***Revised Software Analysis Guidance***
 - ***Software Estimation Guidance***
 - ***Structured Analysis Model***
- ***Software Maintenance Guidance***
- ***Revisions to Current Guidance***

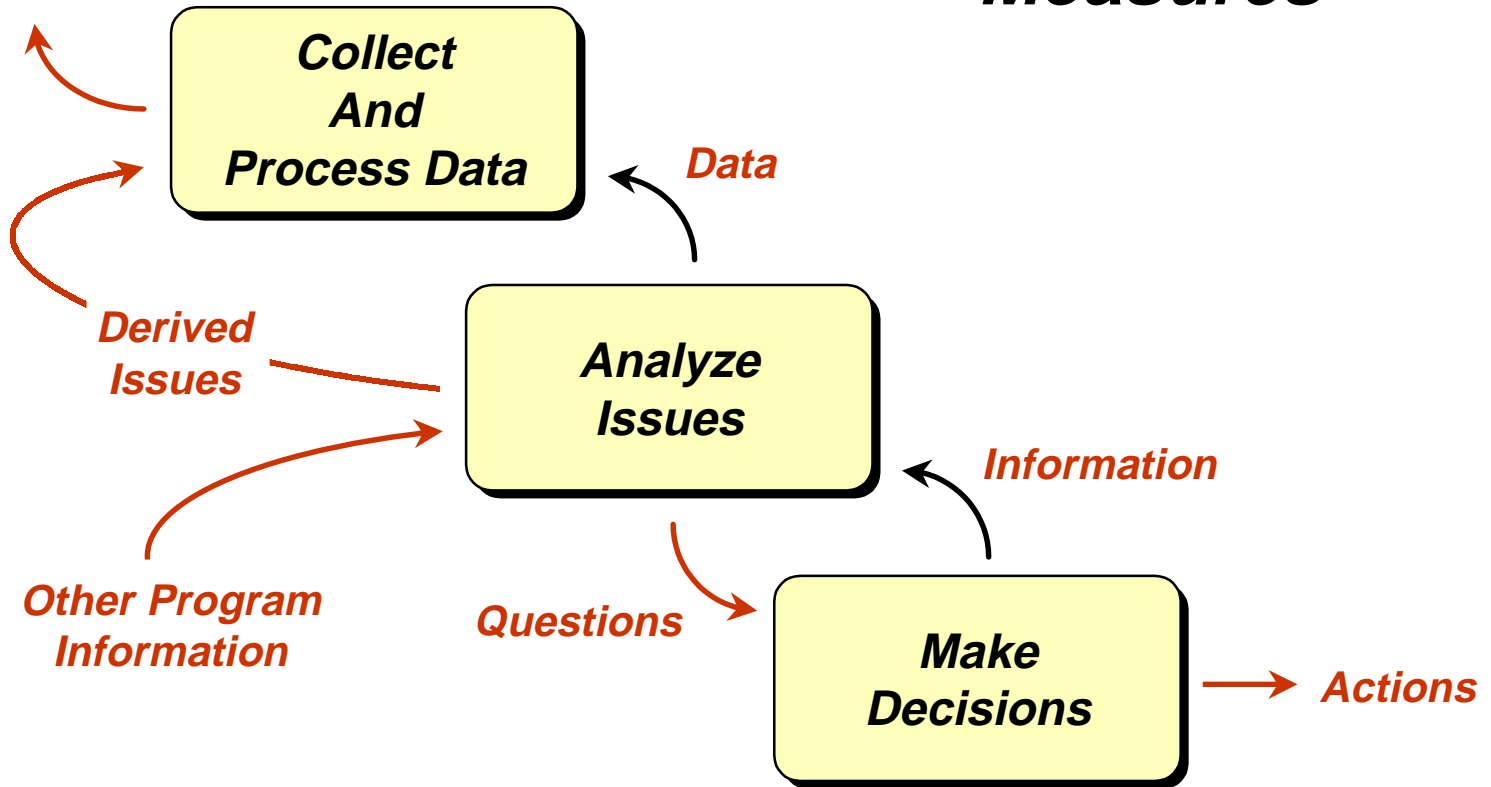
PSM Version 3.0
Measurement Process Revisions

Tailoring Software Measures



Applying Software Measures

Measurement Plan

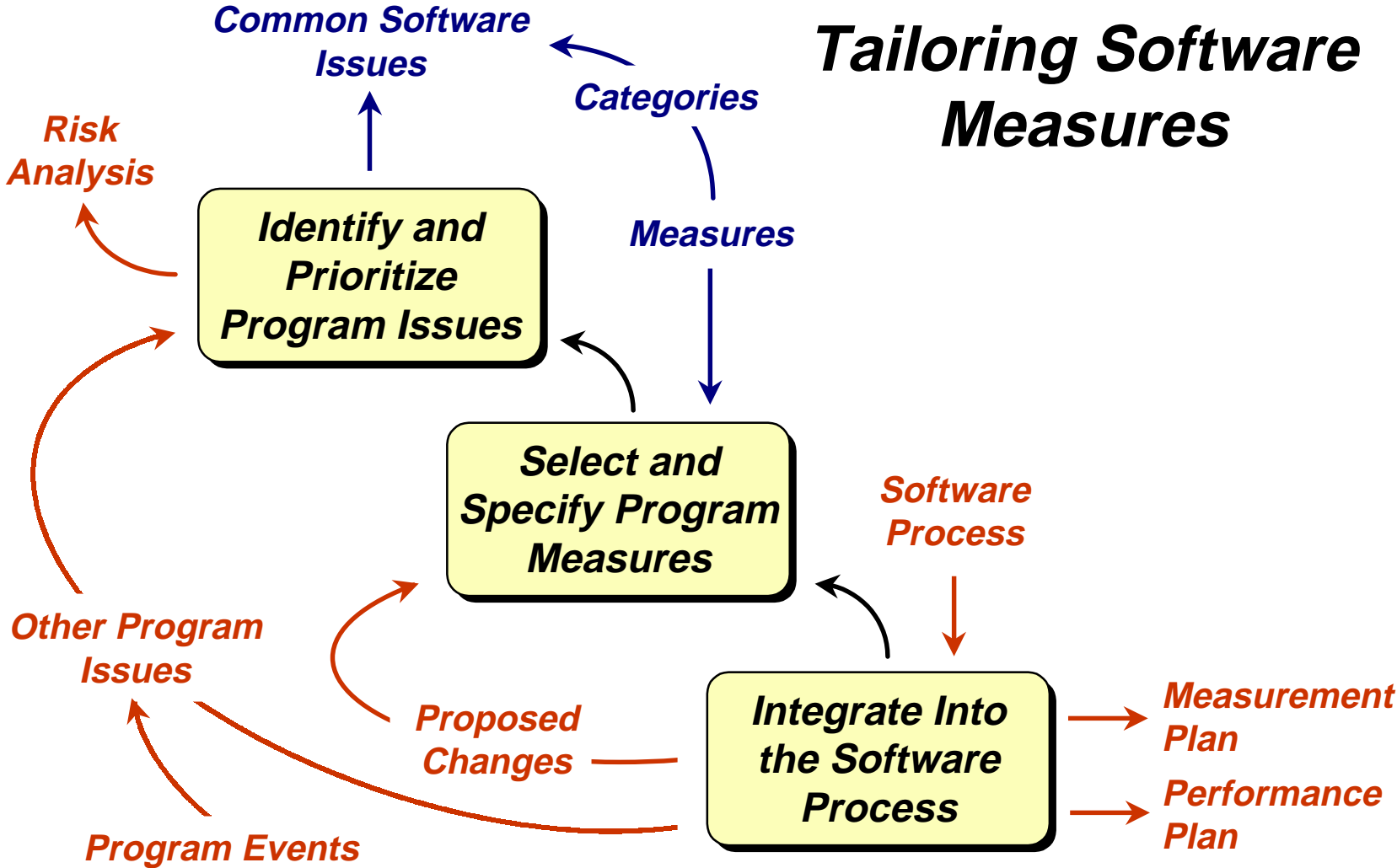


PSM Version 3.0
Risk Management Integration

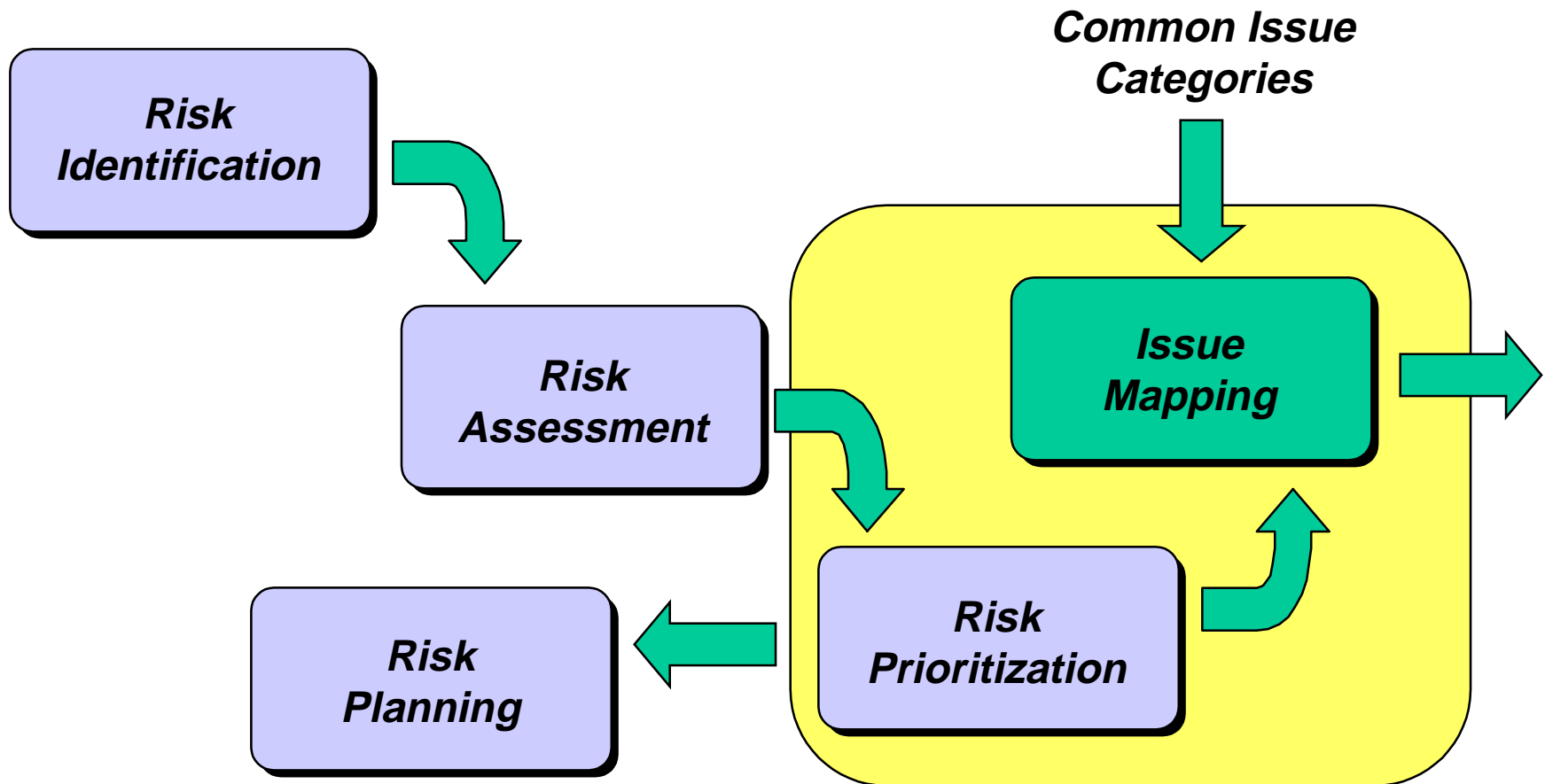
Risk Management Activities

- ***Risk Analysis***
 - ***Risk Identification***
 - ***Risk Assessment***
 - ***Risk Prioritization***
- ***Risk Management***
 - ***Risk Planning***
 - ***Risk Controlling***
 - ***Risk Monitoring***

Tailoring Software Measures



Identify and Prioritize Program Issues



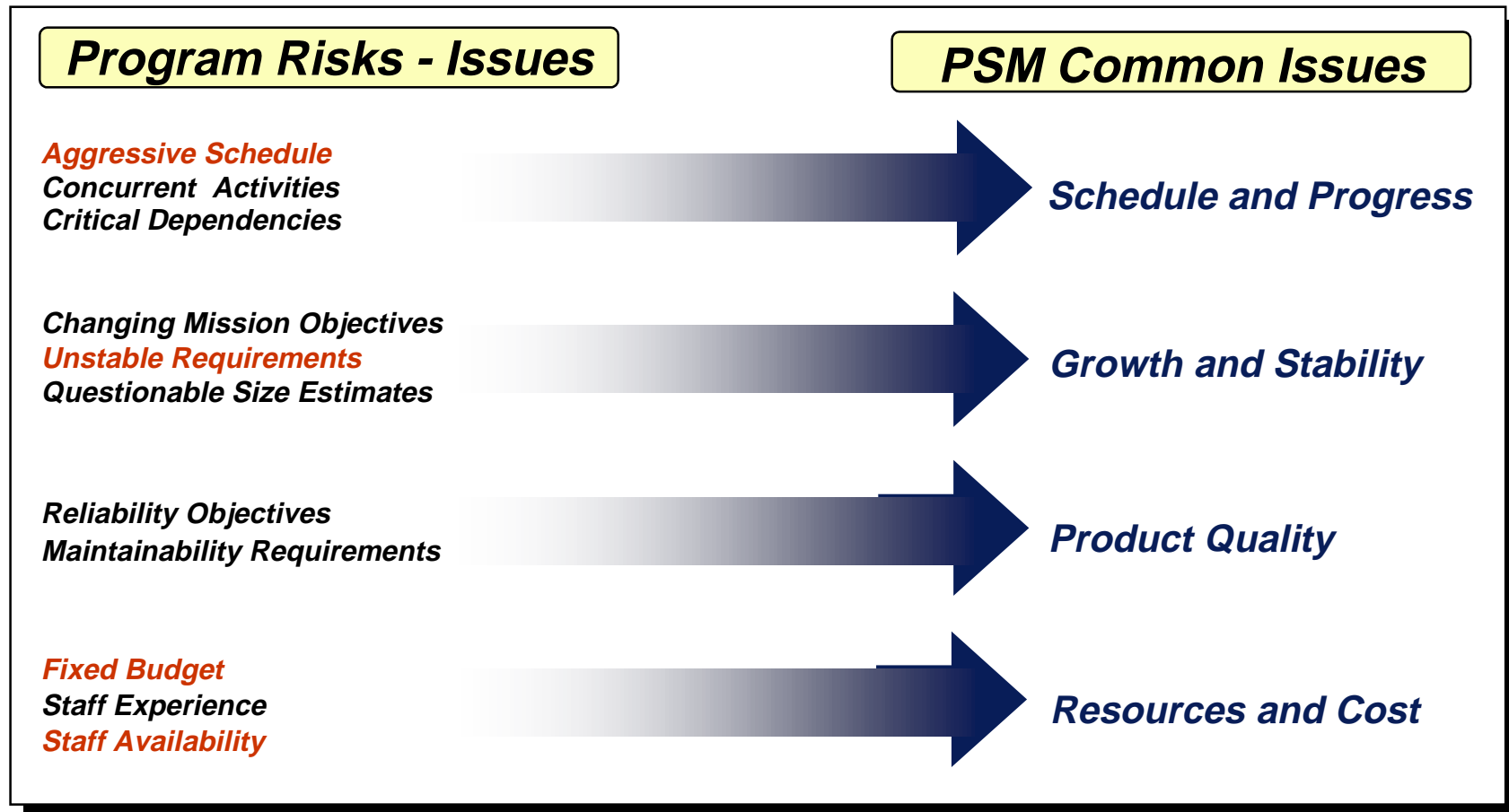
Risk Prioritization

- ***List Risks and Other Program Issues***
- ***Assign Rank Order for “Probability of Occurrence”***
- ***Assign Rank Order for “Impact of Occurrence”***
- ***Compute Risk Exposure as the Product of the Ranks***
- ***Re-order the List Per the Risk Exposure***

Software Risk Analysis

<i>Software Risks</i>	<i>Probability of Occurrence</i>	<i>Impact of Occurrence</i>	<i>Risk Exposure</i>
<i>Aggressive Schedule</i>	<i>8</i>	<i>7</i>	<i>56</i>
<i>Unstable Requirements</i>	<i>5</i>	<i>10</i>	<i>50</i>
<i>Fixed Budget</i>	<i>5</i>	<i>9</i>	<i>45</i>
<i>Staff Availability</i>	<i>5</i>	<i>8</i>	<i>40</i>
<i>Critical Dependencies</i>	<i>6</i>	<i>5</i>	<i>30</i>
<i>Reliability Objectives</i>	<i>6</i>	<i>4</i>	<i>24</i>
<i>Changing Mission Objectives</i>	<i>2</i>	<i>8</i>	<i>16</i>
<i>Concurrent Activities</i>	<i>6</i>	<i>2</i>	<i>12</i>
<i>Staff Experience</i>	<i>2</i>	<i>6</i>	<i>12</i>
<i>Maintainability Requirements</i>	<i>4</i>	<i>2</i>	<i>8</i>
<i>Questionable Size Estimates</i>	<i>3</i>	<i>2</i>	<i>6</i>

Software Issue Mapping



Risk Controlling

- ***Corrective Actions Deal with Currently Identified and Emerging Problems***
- ***Risk Resolution Actions Attempt to Reduce the Probability of and Minimize the Consequences due to Unsatisfactory Outcomes (not yet Problems)***

Risk Monitoring

- ***Measurement Information Helps to Determine Whether Program Risks are Under Control***
- ***Use the Results from Issue Analysis to Update the Risk Analysis***
 - ***Probability of Occurrence***
 - ***Potential Loss***

PSM Version 3.0
Performance Measurement Integration

Performance Measurement

- ***Purpose - track performance of a program relative to its financial plan***
- ***Key Concepts***
 - ***Baseline - approved budget and schedule, i.e., financial plan***
 - ***Earned Value - assessment of work performed relative to the financial plan***

Performance Measurement

- ***Elements of a Performance Plan***
 - ***Identified Work Packages (Technical Content)***
 - ***Budget for Each Work Package***
 - ***Schedule for Completing Work Packages***
 - ***Method for Assessing Degree of Completion***
- ***Integrating Measurement with Earned Value***
 - ***Select a Work Unit Progress Measure for Each Work Package***
 - ***Allocate the Work Package Budget to Individual Work Units***

Performance Measurement Considerations

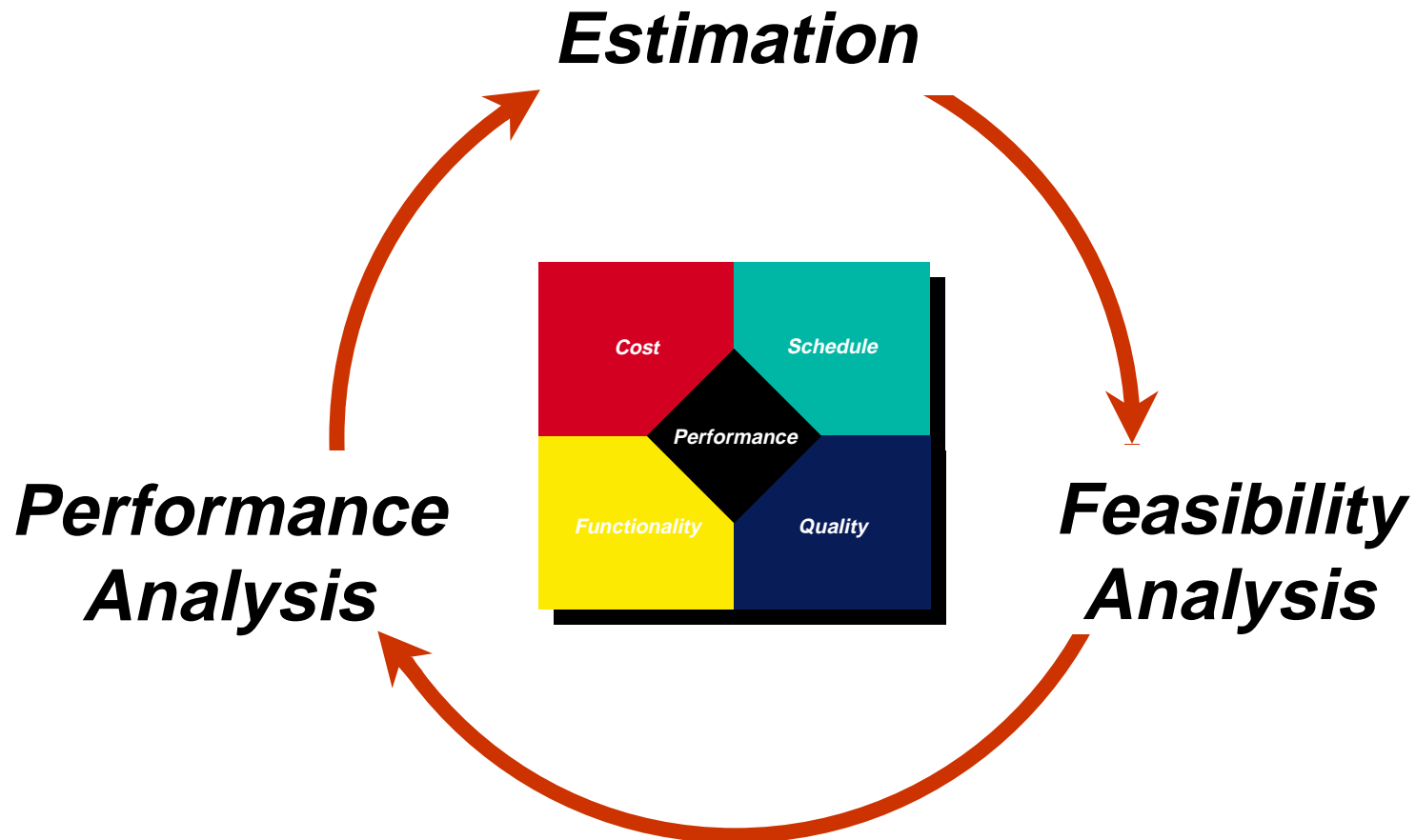
- ***Work Packages Should be Defined in the Work Breakdown Structure***
- ***Earned Value Techniques Focus On Cost And Schedule Information***
- ***Growth in Size or Complexity, Poor Product Quality, Etc. May Not be Detected***
- ***Work Unit Progress and Earned Value are Usually Not Sufficient by Themselves***

PSM Version 3.0
Revised Software Analysis Guidance

Primary Software Tradeoffs

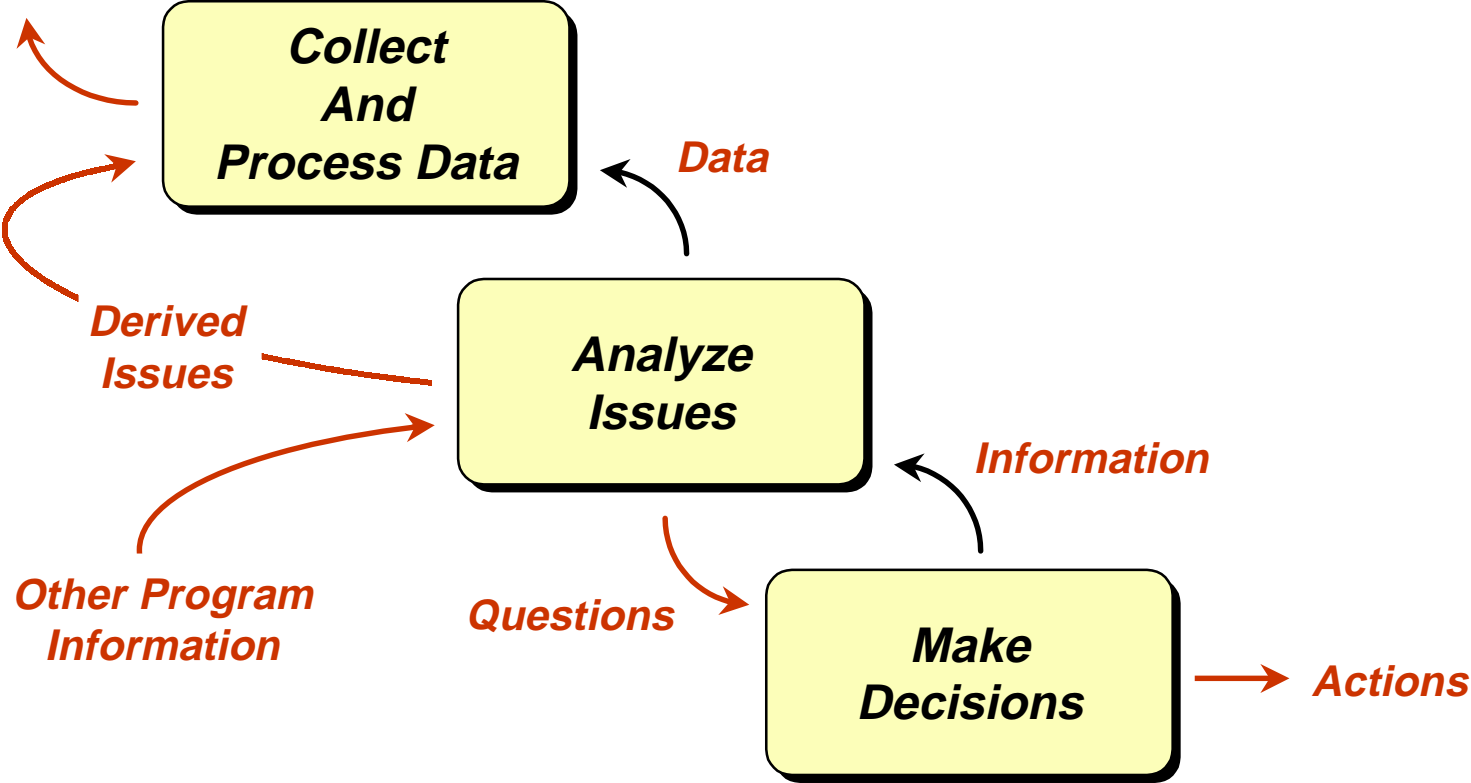


Types of Measurement Analysis

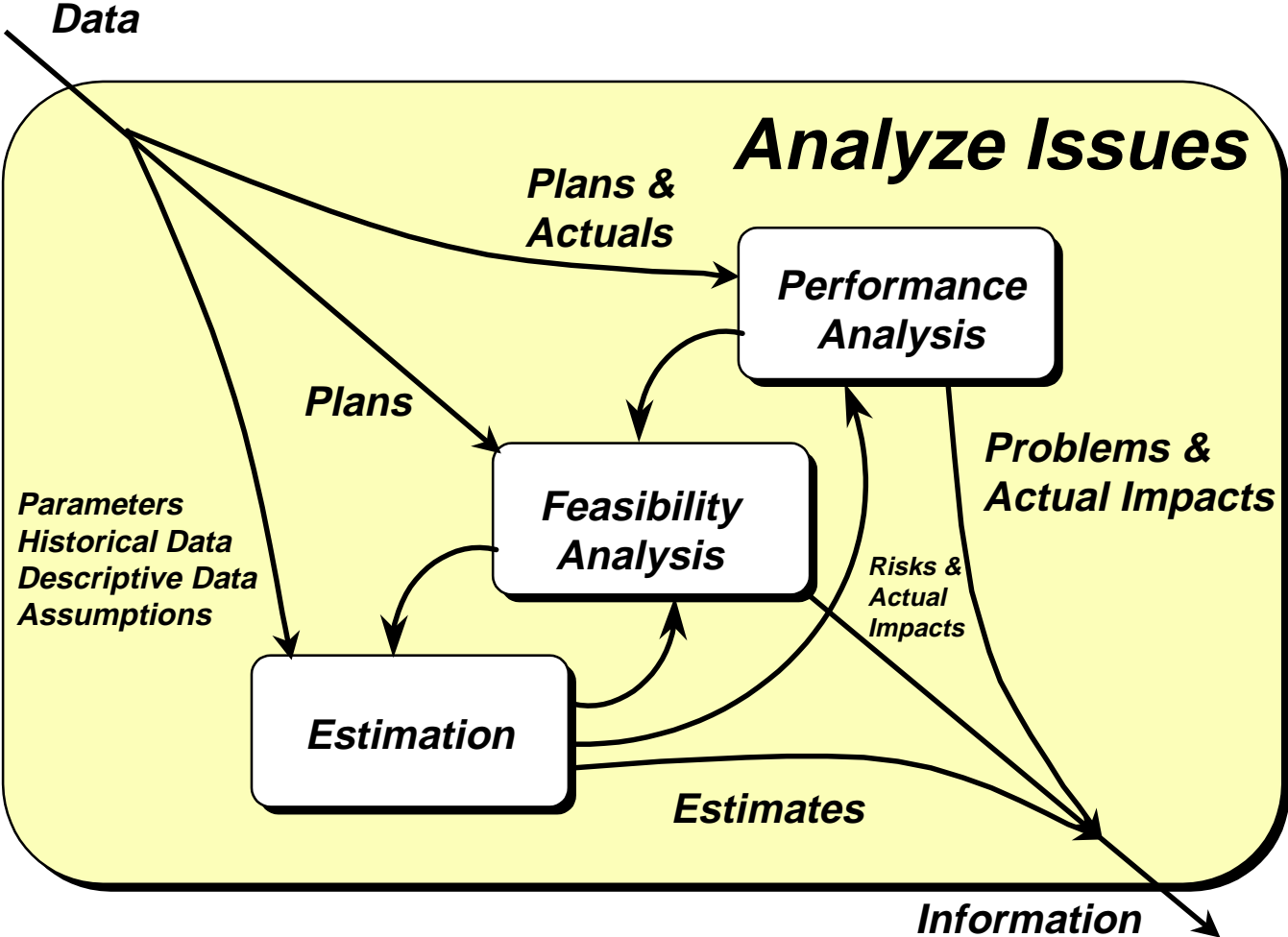


Applying Software Measures

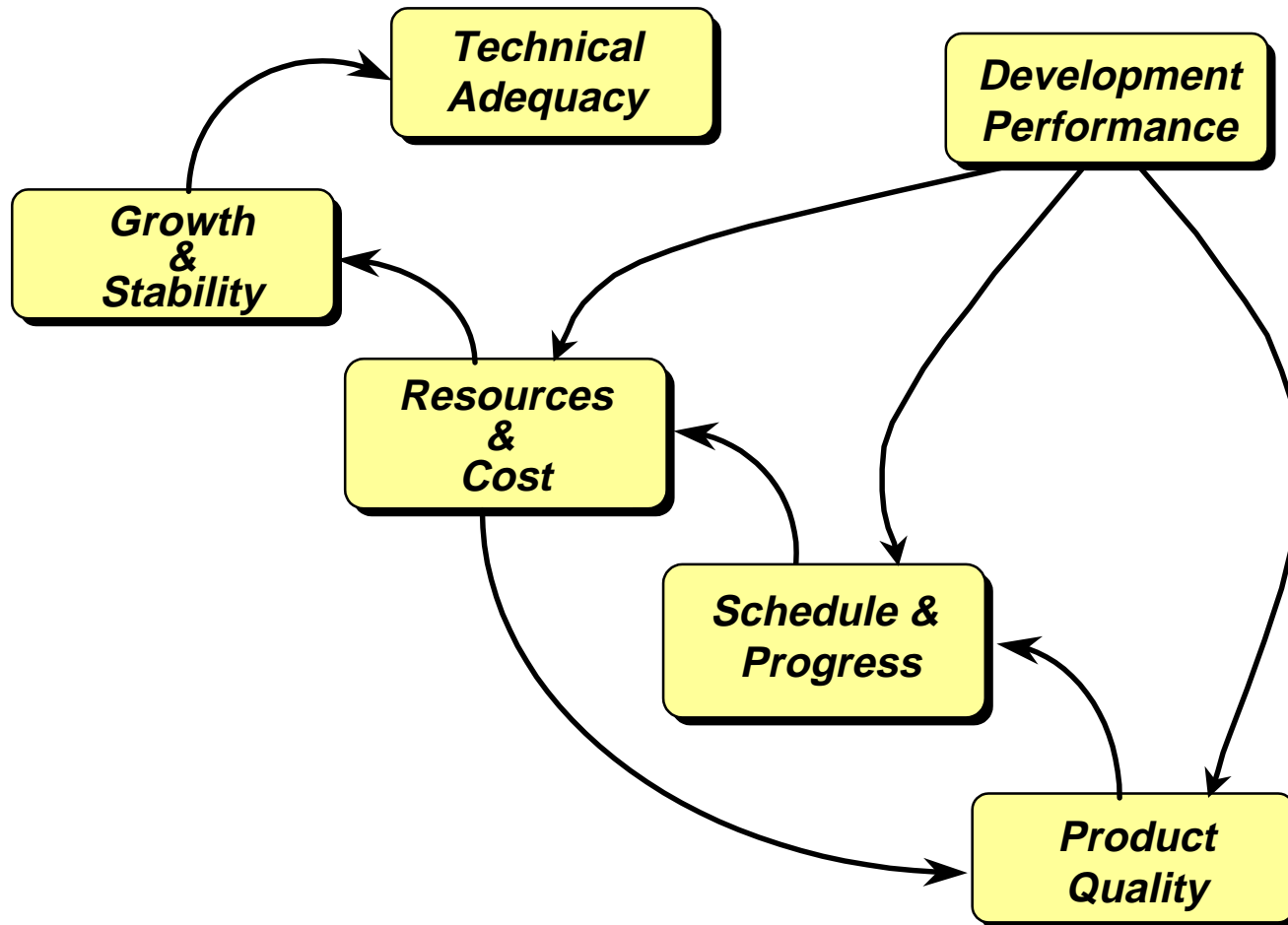
Measurement Plan



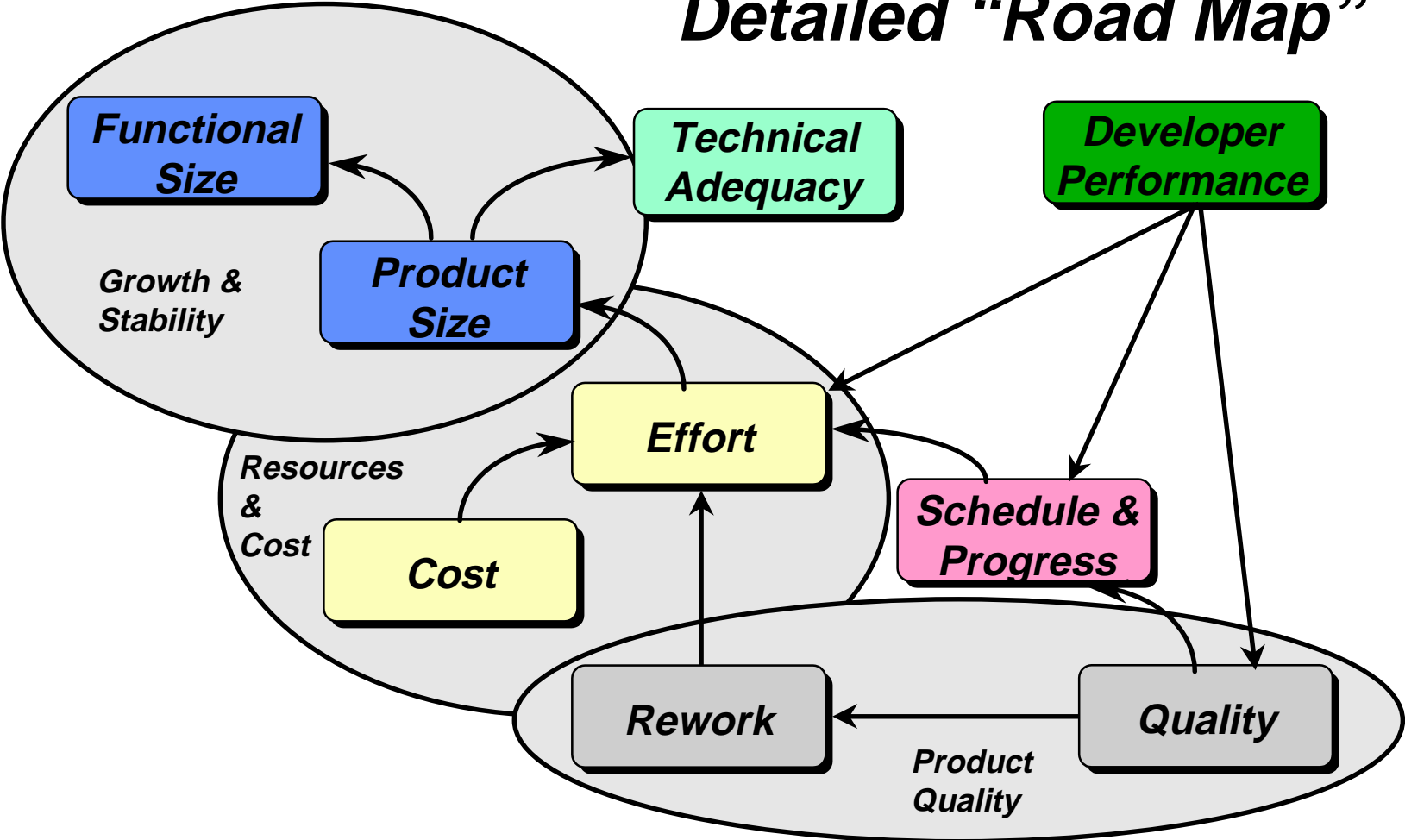
PRACTICAL SOFTWARE MEASUREMENT



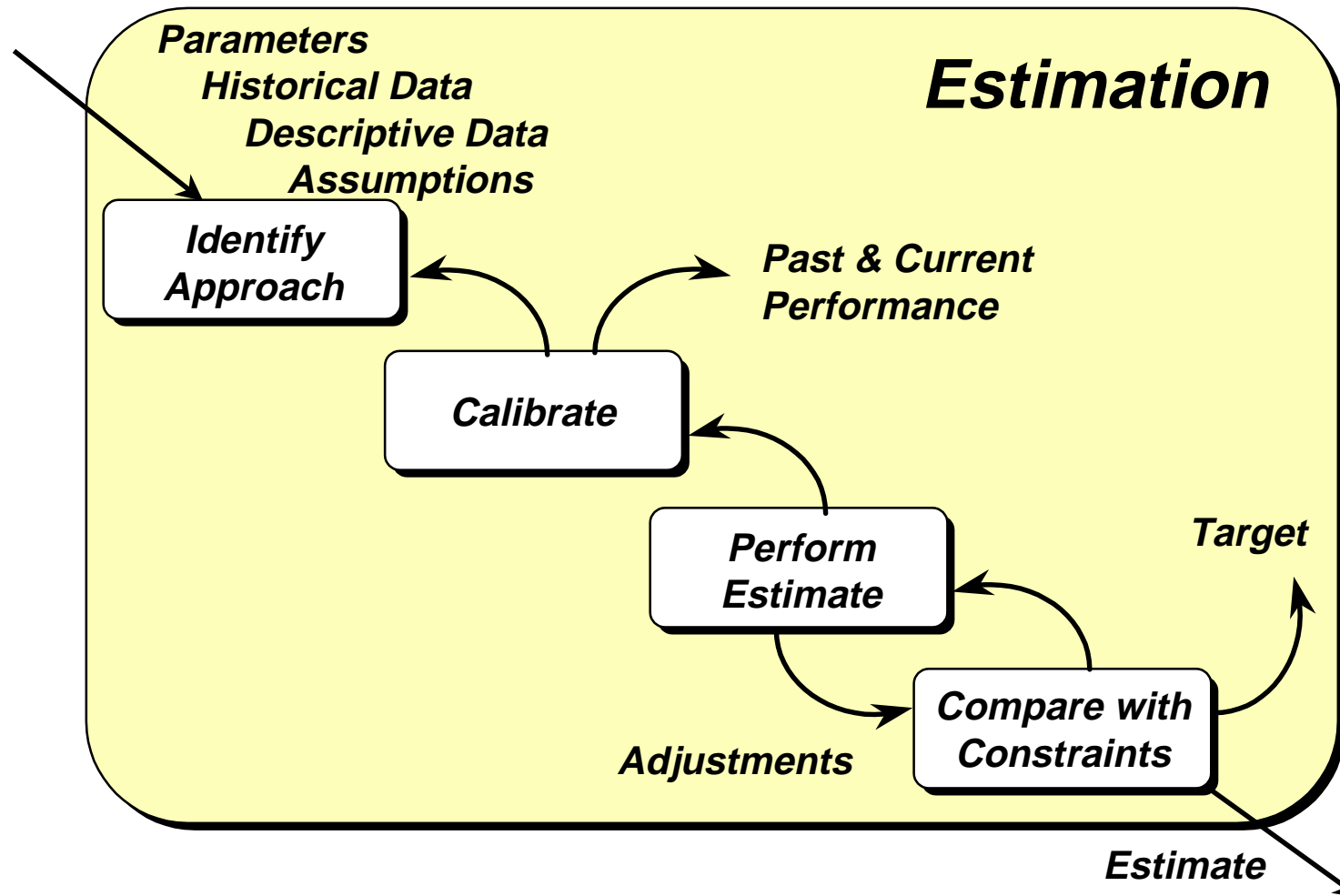
Issue Analysis “Road Map” - High Level



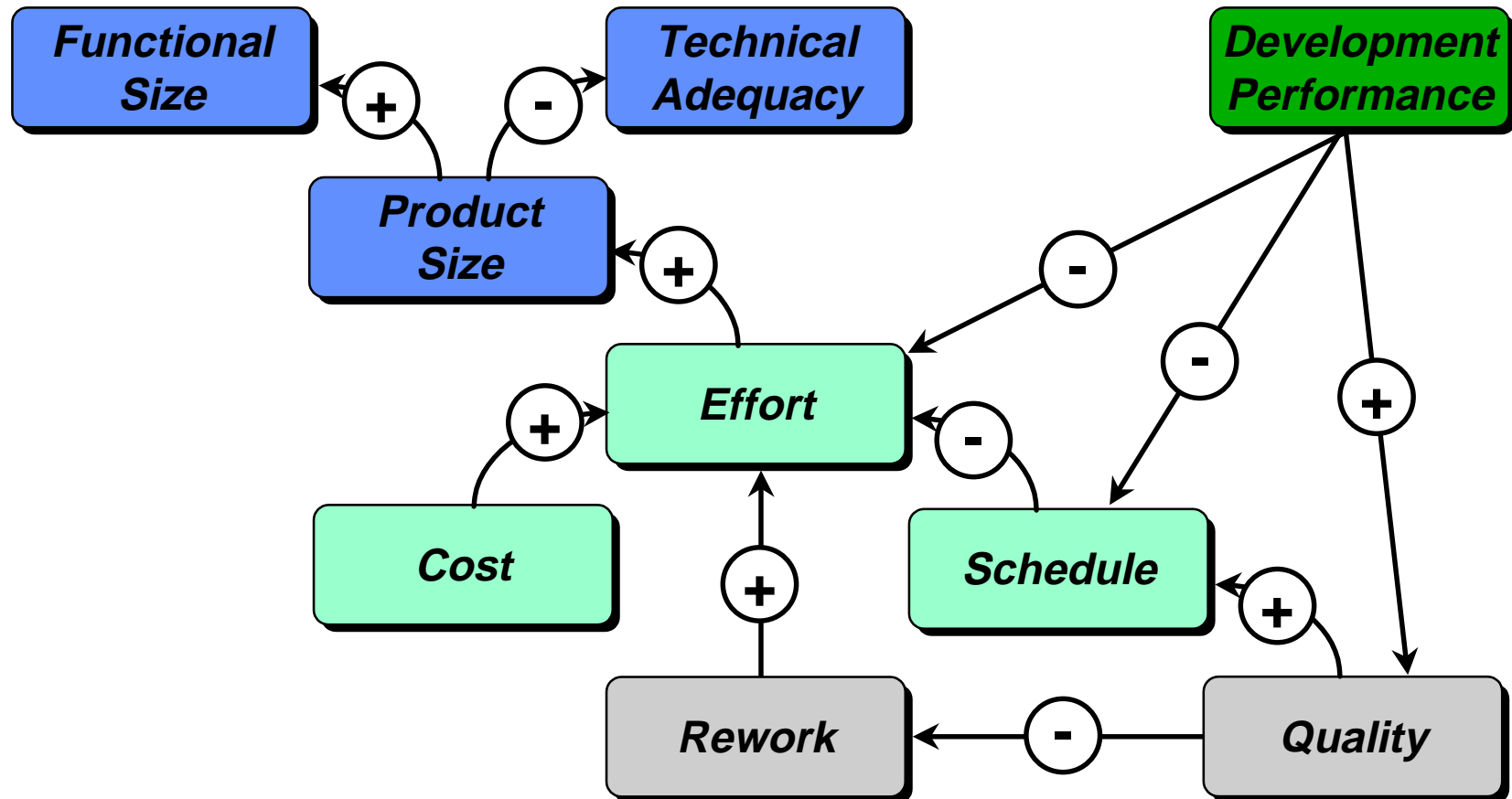
Detailed "Road Map"



PRACTICAL SOFTWARE MEASUREMENT



Estimation "Road Map"



Fundamental Estimation Concepts

- ***Estimates are Made by People, Not by Models***
- ***All Estimates are Based on Comparisons***
- ***Before We Can Estimate, We Must First Acquire Knowledge***

*R. E. Park and P. B. Korda, "Making estimates credible",
Journal of Parametrics, June 1989*

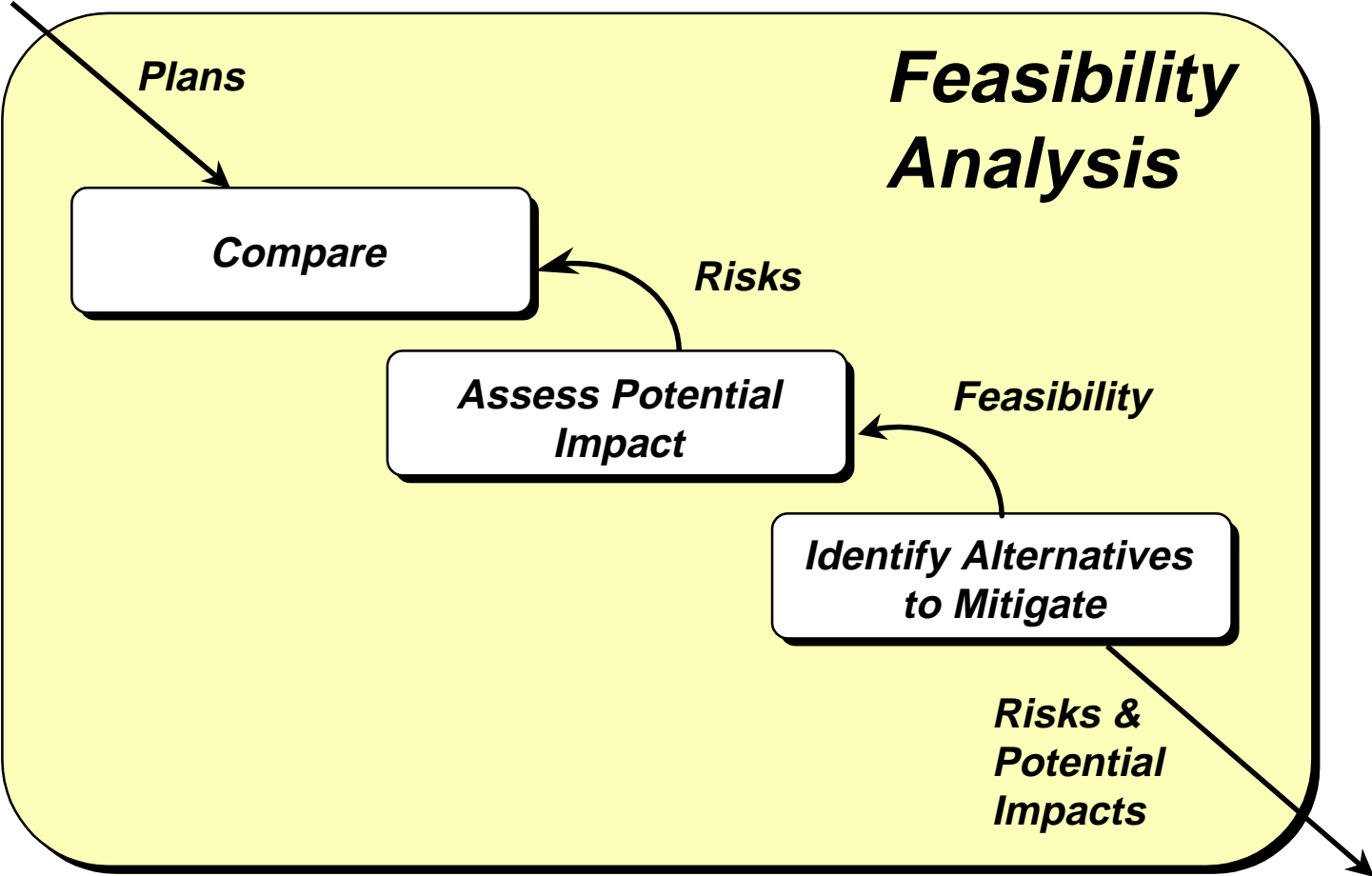
Software Estimation Steps

- ***Analyze Work Requirements -Tasks - Process***
- ***Estimate Software Size (In terms of Function Points, Lines of Code, Other Units)***
- ***Compute Effort Required (using Productivity Data or Formal Model)***
- ***Determine Schedule Length and Milestones***
- ***Review Estimates (per Checklist)***
- ***Conduct Tradeoff (What If) Analysis***

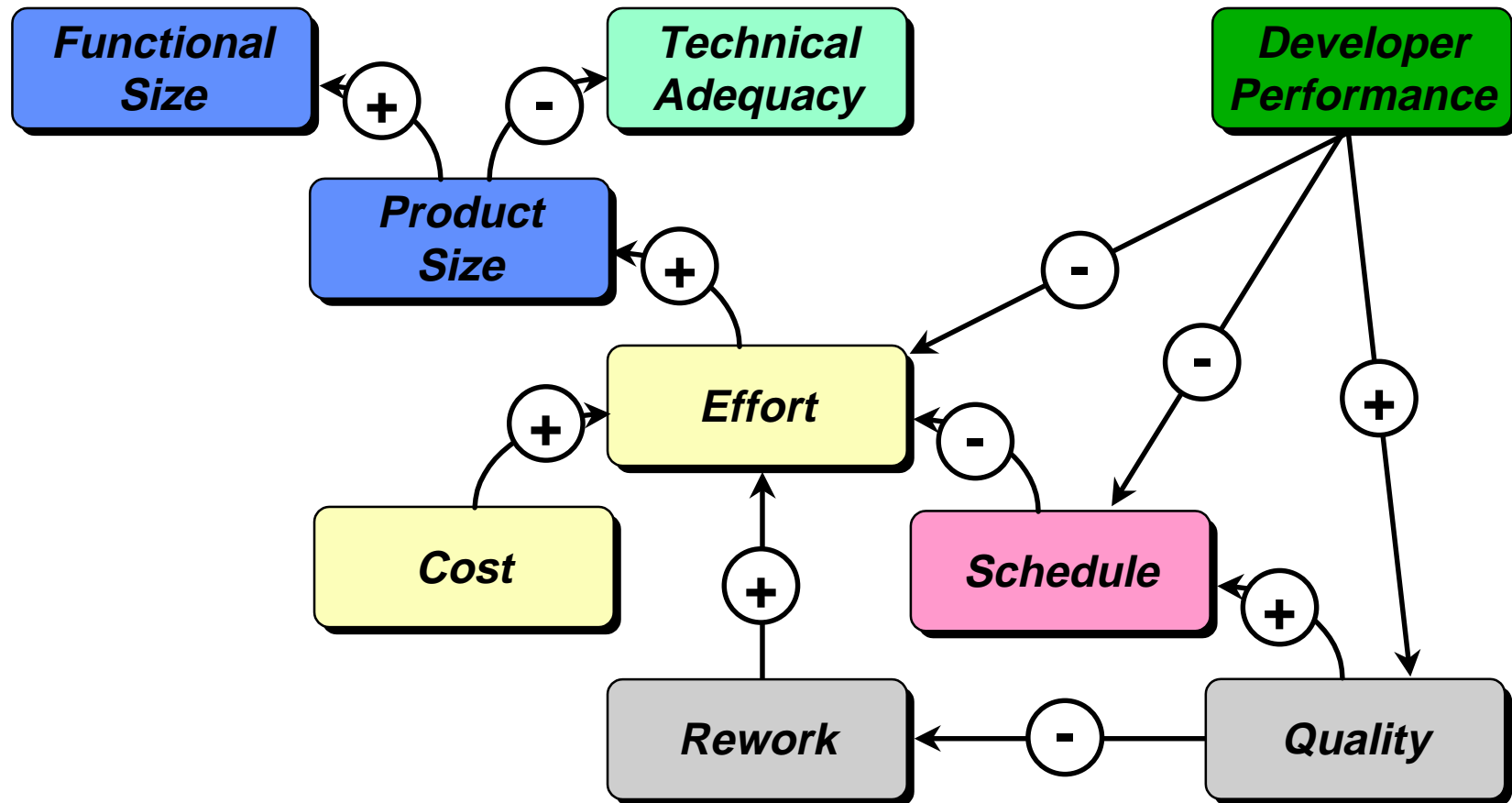
Software Estimation Checklist

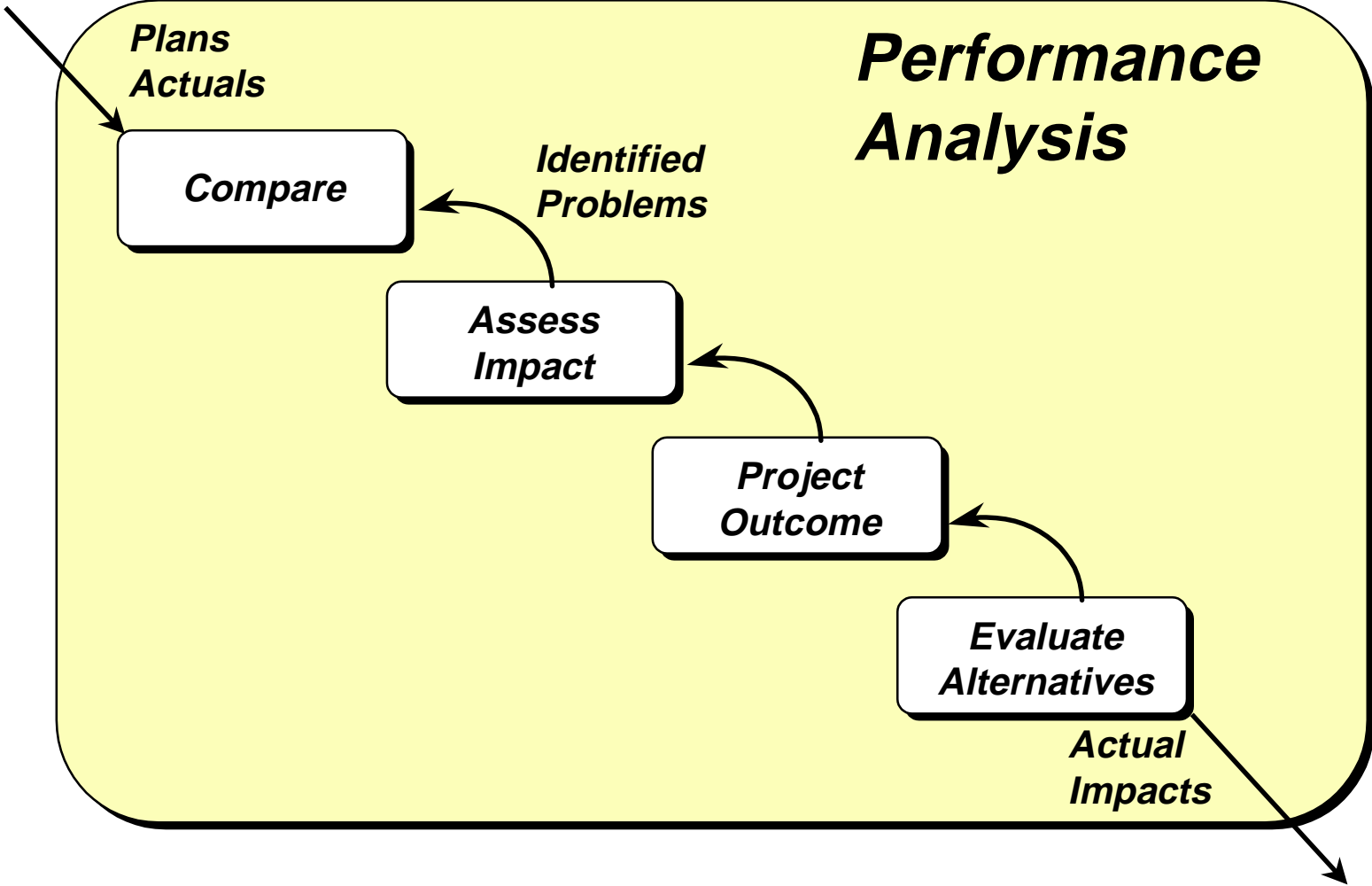
- ***Has a Firm Foundation Been Established for the Estimate of Software Size?***
- ***Are the Numbers Correct and are the Models Used Correctly?***
- ***Has the Estimation Method Been Mapped to the Process?***
- ***Have Reasonable Assumptions Been Made About Product and Process Factors Affecting Productivity?***
- ***Are the Anticipated Base Productivity and Error Rates Consistent With Previous Experience?***
- ***Are Aggressive Goals Supported by Realistic Strategies for Achieving Them?***
- ***Have Any Assumptions Changed Since the Last Estimate?***
- ***Have any Alternative Estimation Methods been Applied for Comparison?***

PRACTICAL SOFTWARE MEASUREMENT

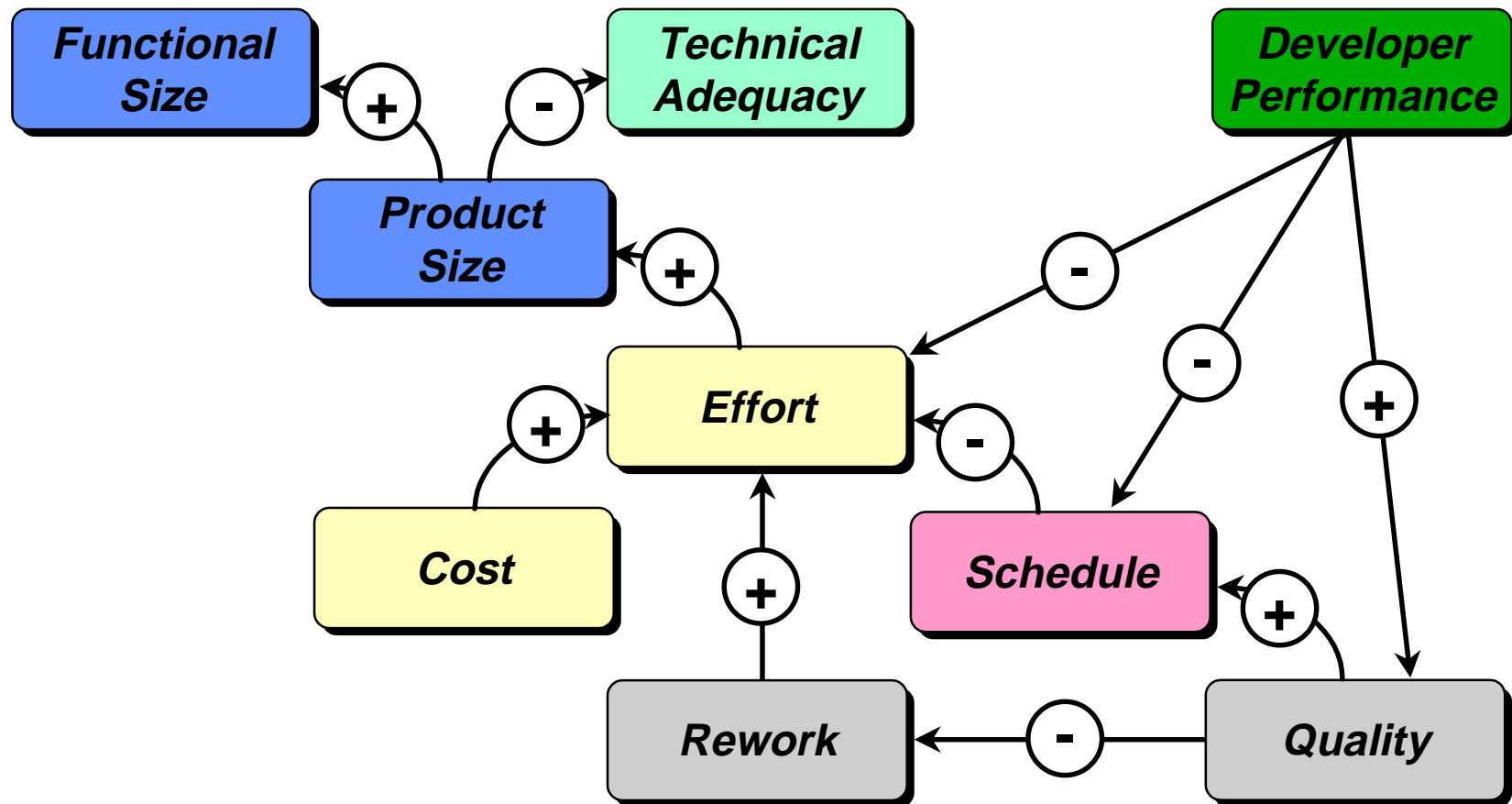


Feasibility Analysis “Road Map”

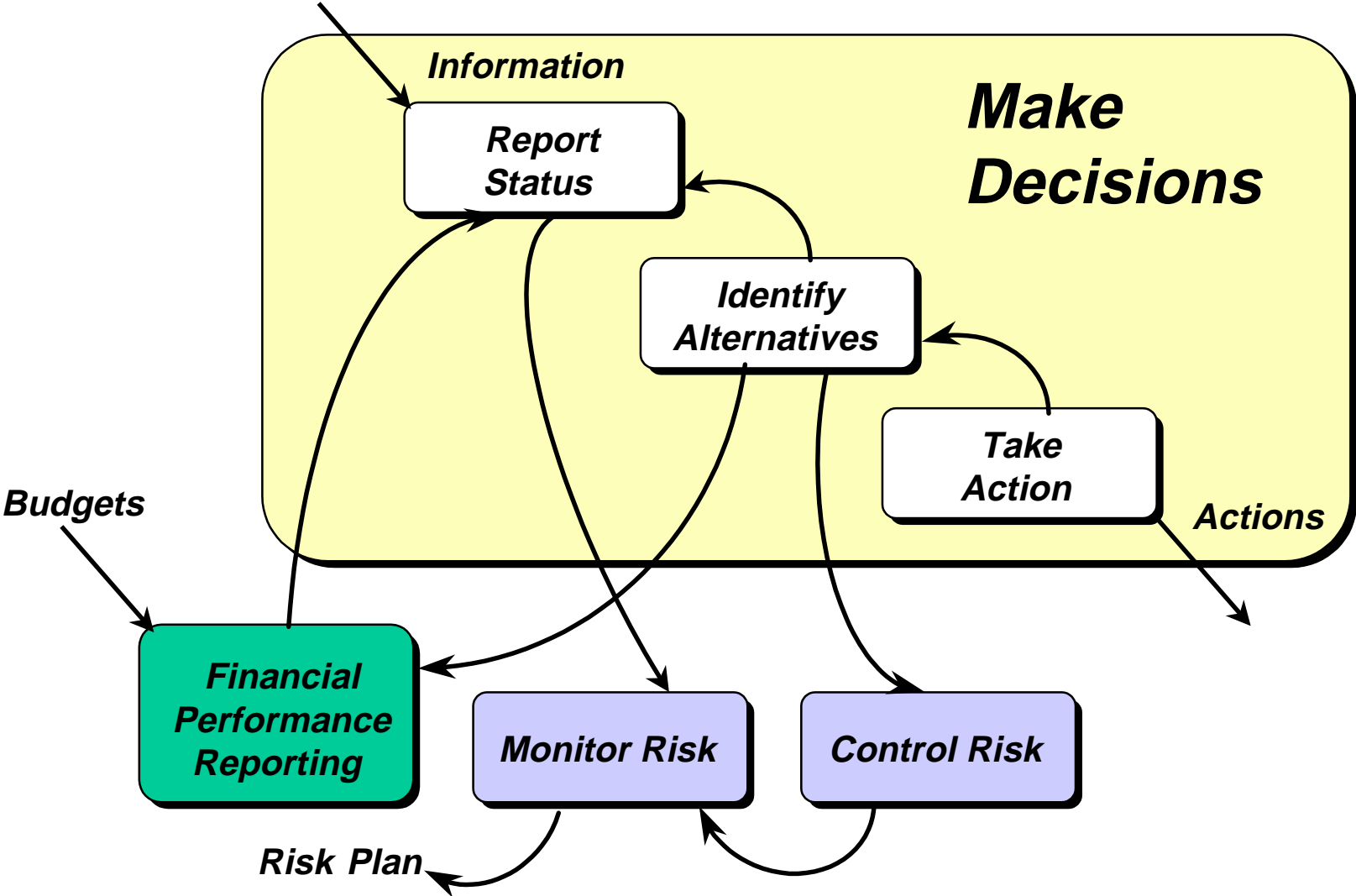




Performance Analysis “Road Map”



PRACTICAL SOFTWARE MEASUREMENT

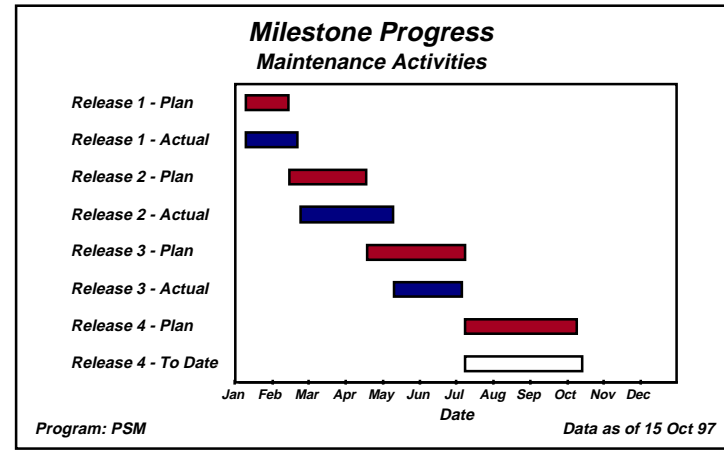
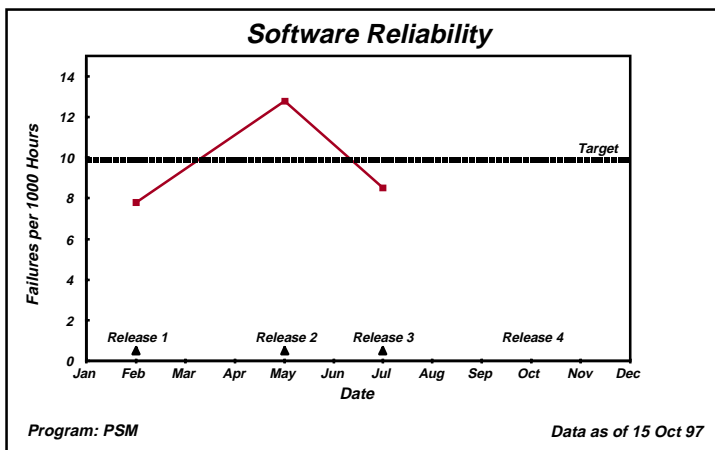
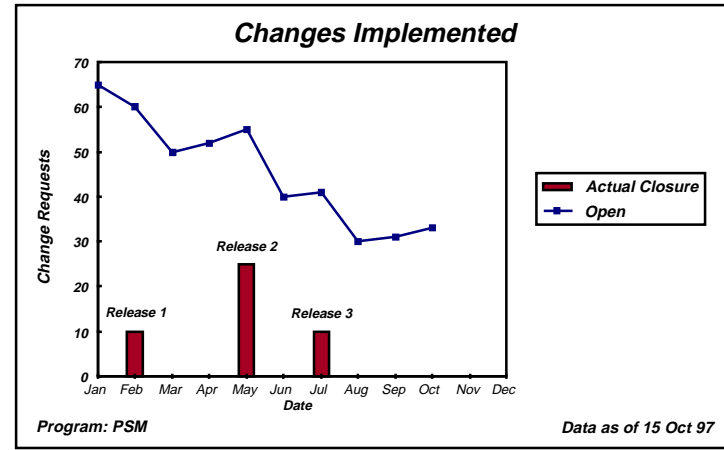
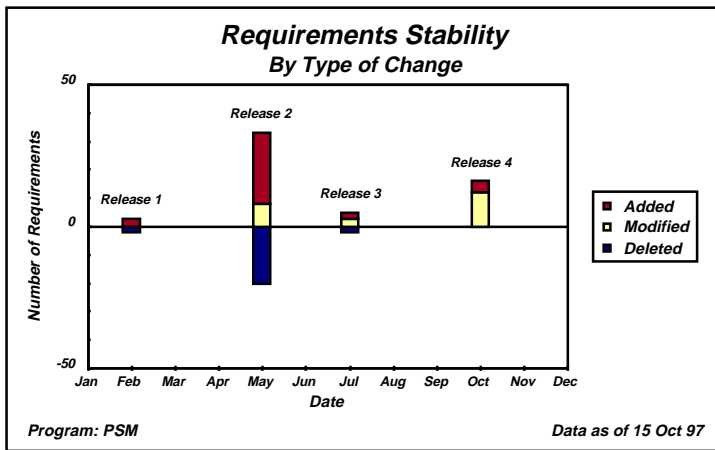


PSM Version 3.0
Software Maintenance Guidance

Software Maintenance

- ***Definition - Small Changes and Fixes Made to a System after Initial Deployment (Major Enhancements are Treated like Development)***
- ***Special Concerns***
 - ***Staffing and Resources Usually Fixed (Size of Change and Functionality Usually Negotiable)***
 - ***Many Work Items Processed Rapidly***

Integrated Software Maintenance Analysis



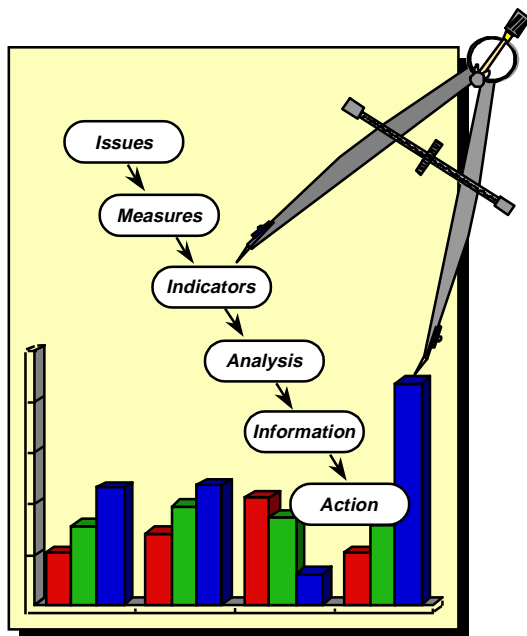
PSM Version 3.0
Other Proposed Changes

Other Proposed PSM 3.0 Changes

- ***Update Measurement Principles***
- ***Revise DoD Contracting Guidance***
- ***Generalize PSM Target User***
- ***Address IPT Implementation***
- ***Add Software Maintenance Examples***
- ***Add Tailoring, Risk Management, and Estimation to Case Studies***
- ***Revise Measurement Tables***
- ***Update Indicator Examples***
- ***Acquisition Reform Update***

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PSM 3.0 Discussion Topics

July 22, 1997

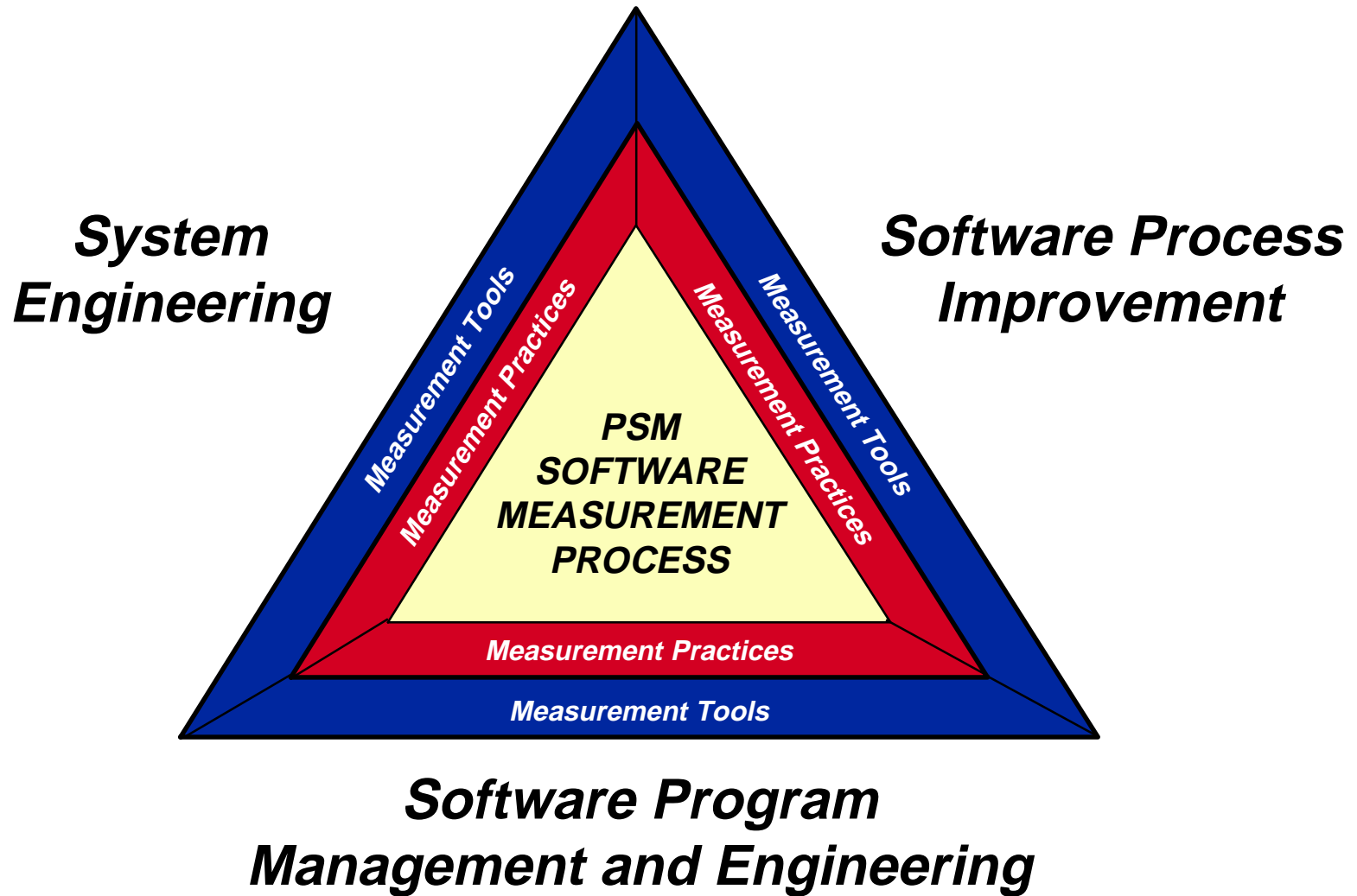
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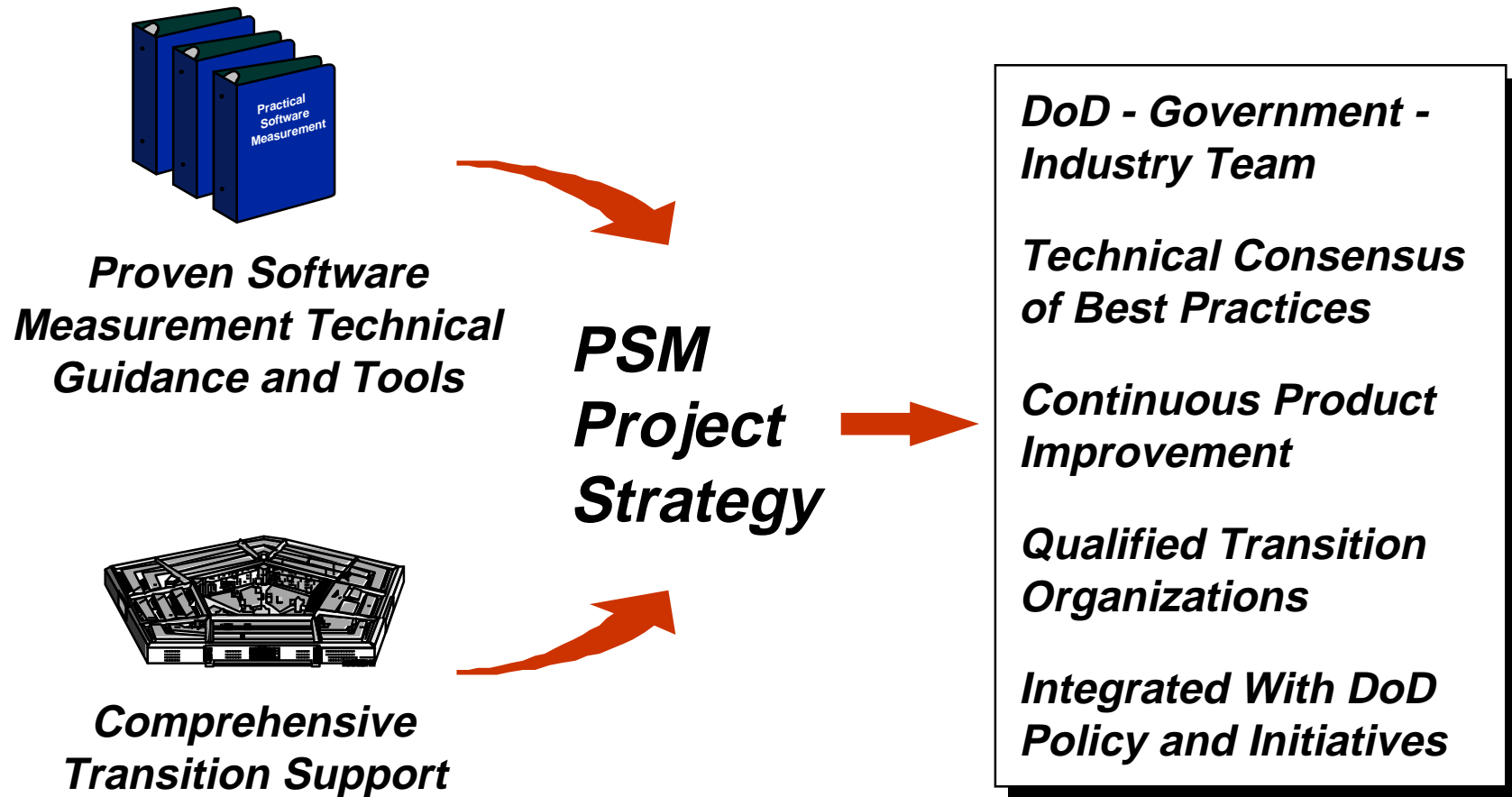
Key Discussion Topics

- ***Other Input - Ideas - Requirements***
- ***Comments on Planned Revisions***
- ***Document Format***
- ***Training Requirements***
- ***PSM Project Plan***

PRACTICAL SOFTWARE MEASUREMENT



PSM Project Strategy



Integrating DoD Software Initiatives

