

C4ISR Assessment: Past, Present, & Future

8th International Command and Control
Research & Technology Symposium

Dr Stuart H. Starr
The MITRE Corporation

17 - 19 June 2003

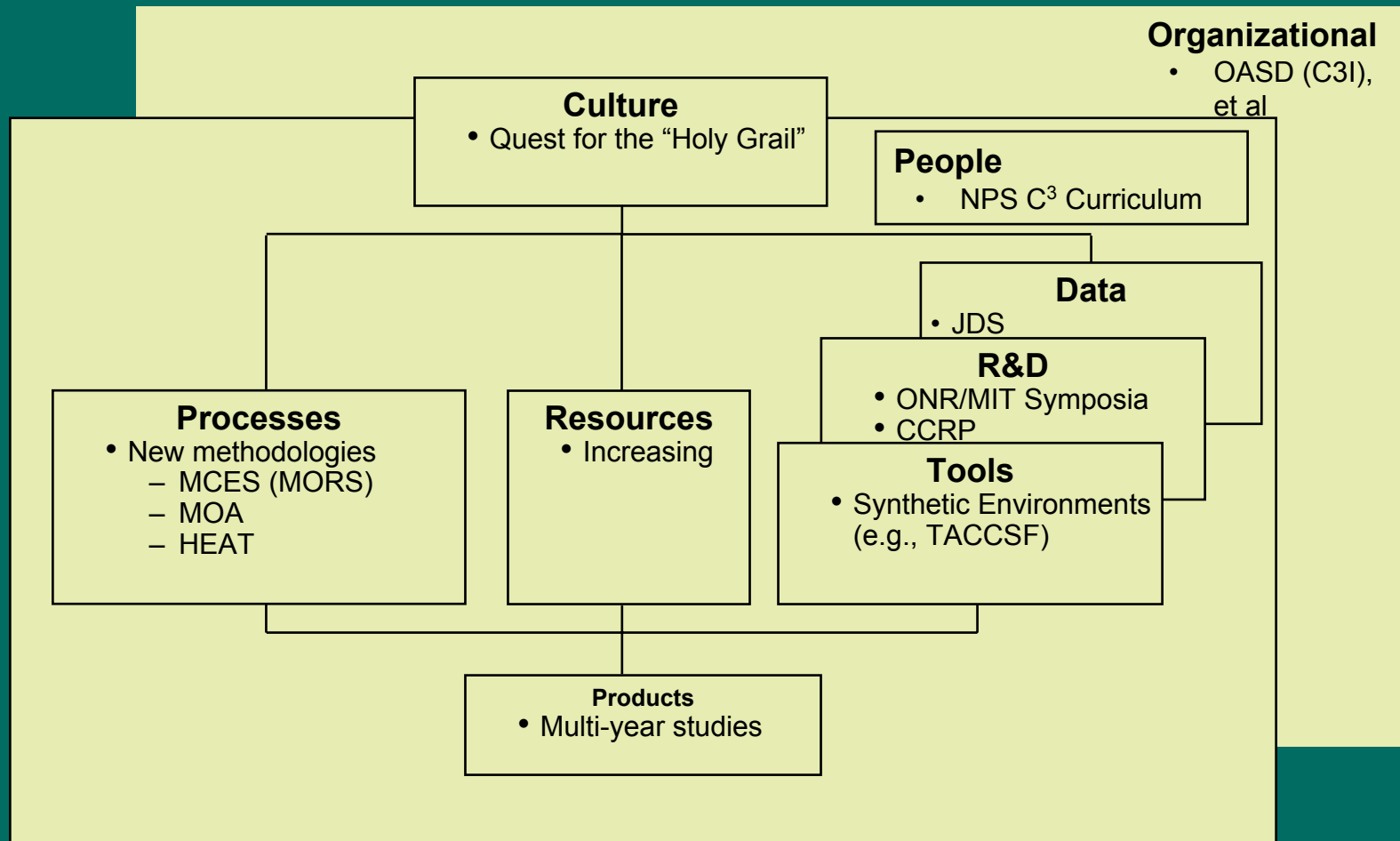
Agenda

- Past
- Present
- Future

“Pre-Awakening” (Pre-1975)

- Substantively: general insensitivity to C2 issues
 - C2 often assumed to be
 - “perfect”
 - a second or third order effect, or
 - ignored
 - When considered, often treated as a “patch” (e.g., additional term in Lanchester’s equations)
- Institutionally: fragmented within DoD; e.g.,
 - DTCCS
 - ASD(Intelligence)
 - Defense Support in DDR&E

C2 Assessment (Prior to mid-90's)



Agenda

- Past
- Present
- Future

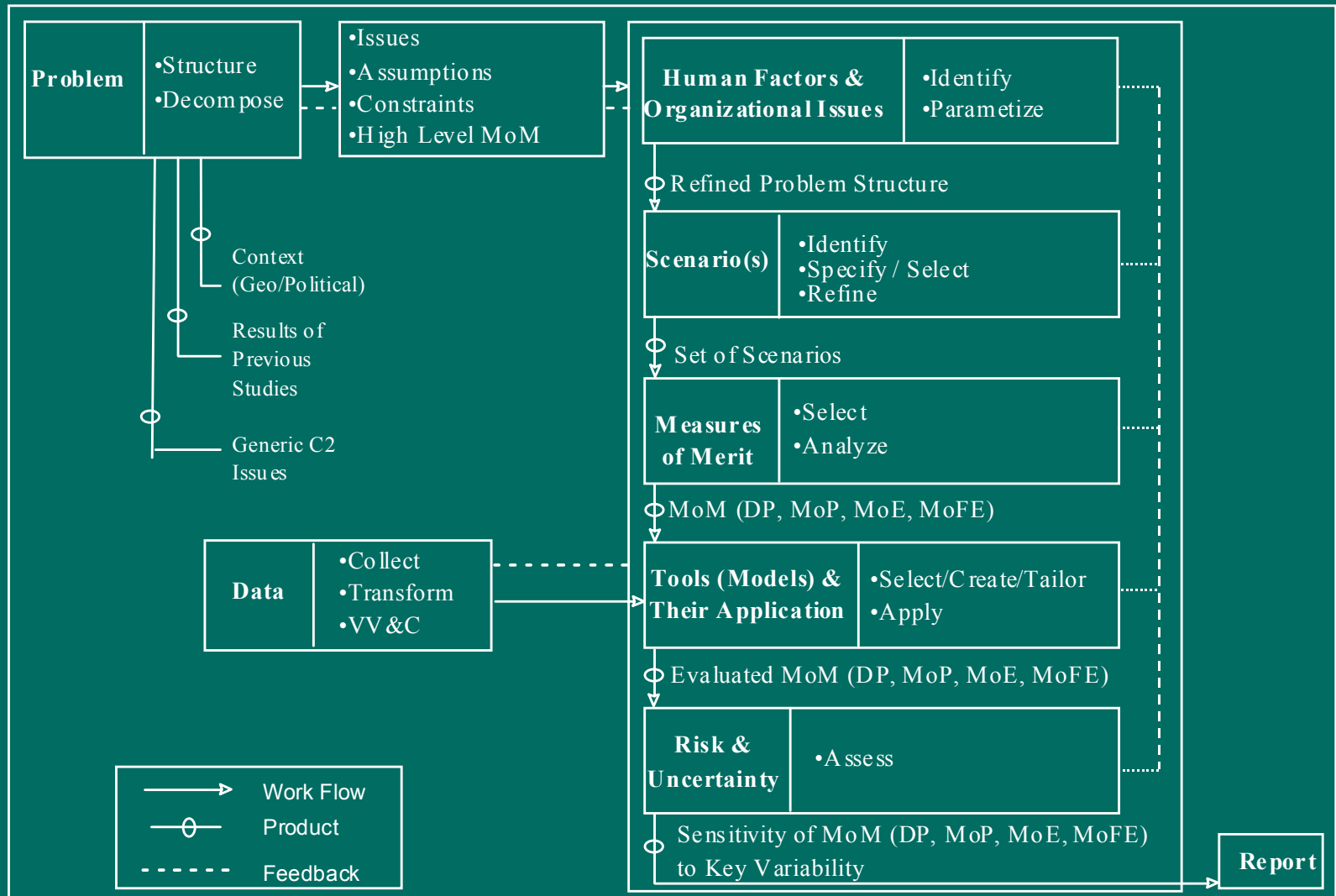
Initial NATO COBP for C2 Assessment

- What -- Develop a Code of Best Practice (COBP) for C2 Assessment for *conventional warfare*, focused on land combat
- Who: NATO Panel SAS-002
 - Representatives from 9 countries (NC3A observer)

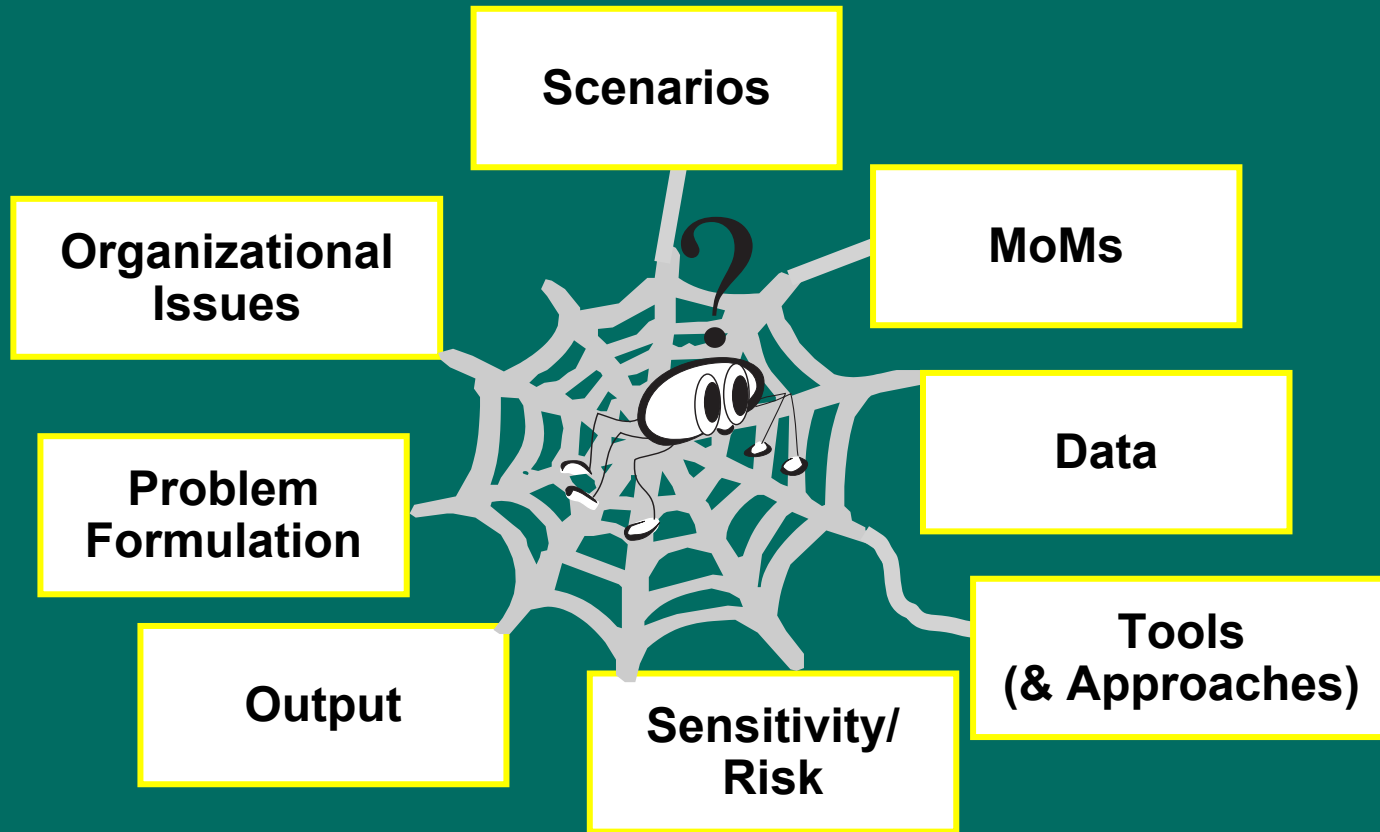


- When
 - NATO Panel was initiated in 1996
 - COBP agreed in Fall 1998
 - Symposium (SAS-039) conducted in Paris (1999)
 - COBP published as RTO Technical Report 9 (1999)
 - UK Short Form issued in 1999

Recommended C2 Assessment Methodology



C2 Assessment Process: a “Web” *vice* a Linear Process

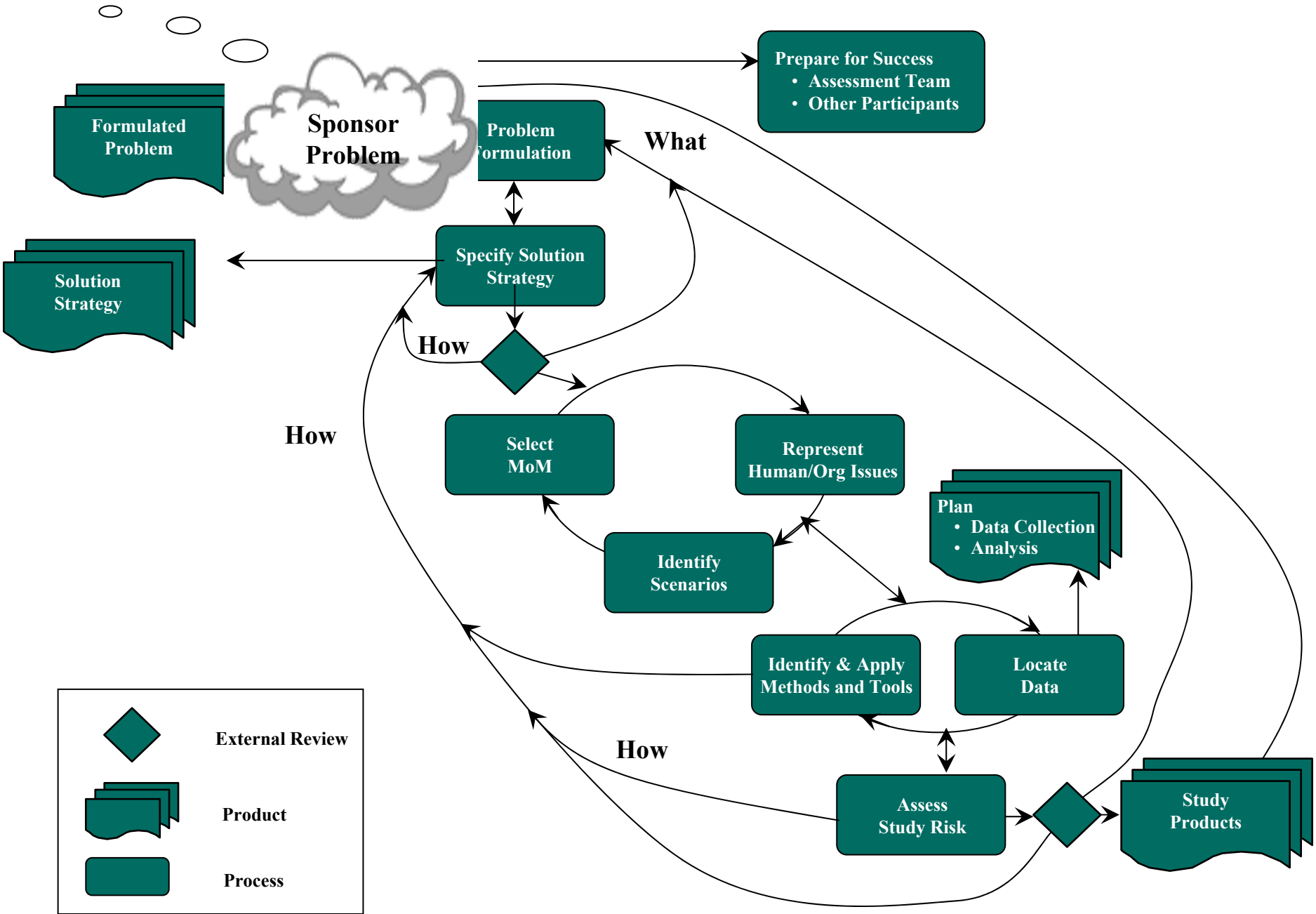


Recent Enhancements to the CoBP

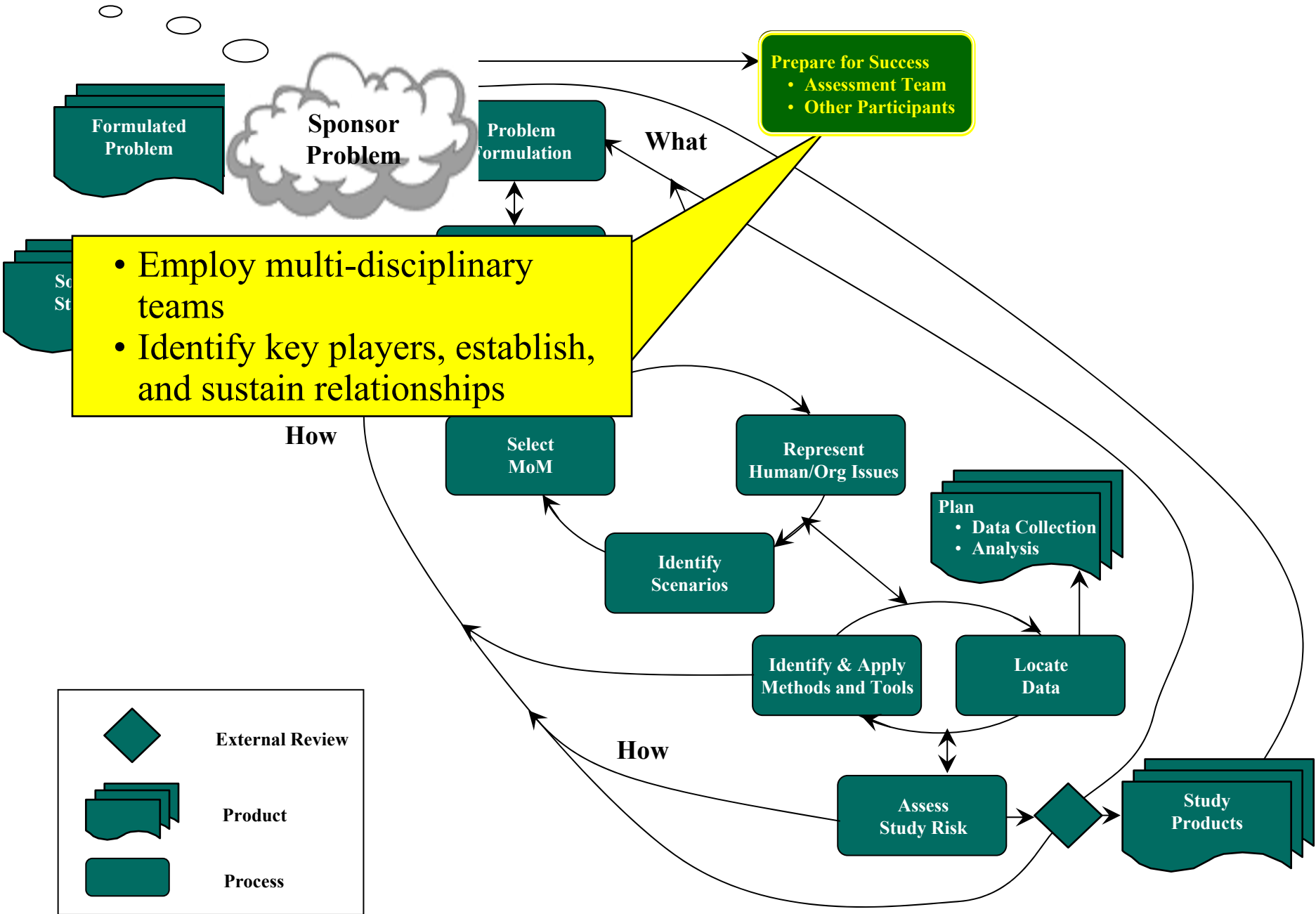
- Who -- NATO Panel SAS-026:



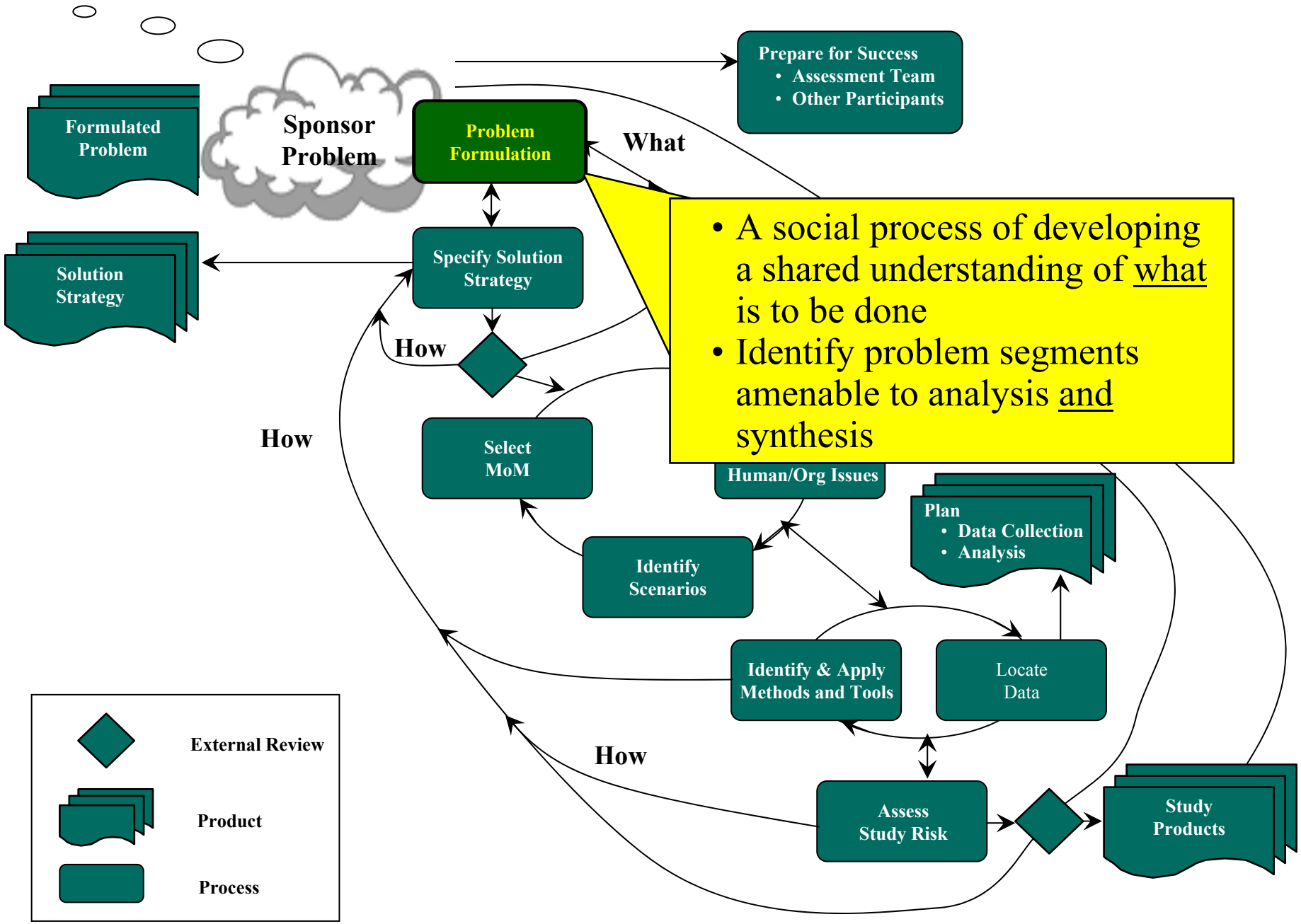
- What
 - Goal: Extend NATO CoBP for C2 Assessment to *Operations Other Than War (OOTW)*
 - Objective: Reflect insights derived from two case studies
 - A “relatively” well defined subject -- assessing alternative options for Civil Military Cooperation (CIMIC) facilities for the Stabilization Force (SFOR), Bosnia
 - A broad assessment of C2 to support SFOR
- When
 - Completed Fall 2002



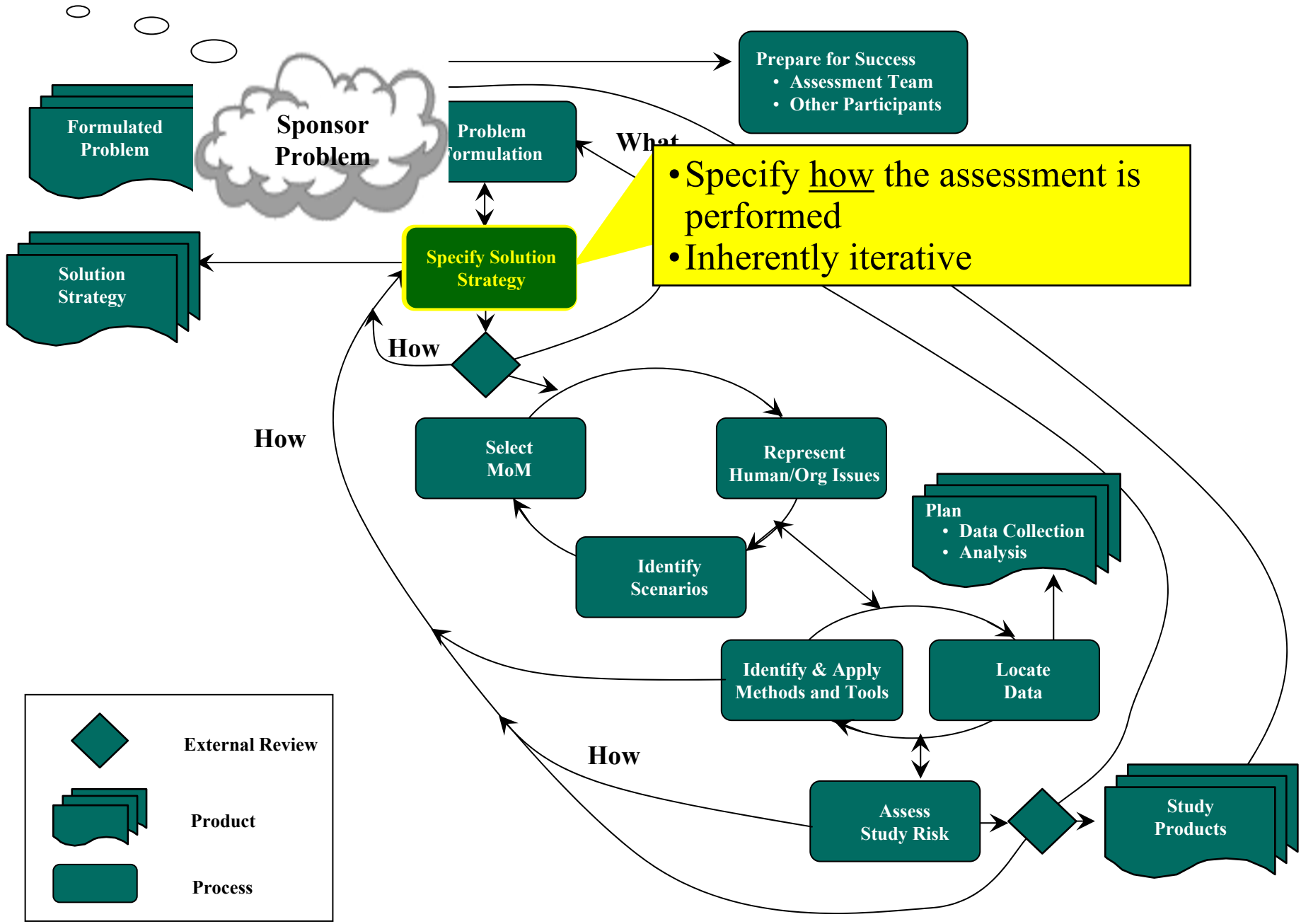
C2 Assessment Process (SAS-026)



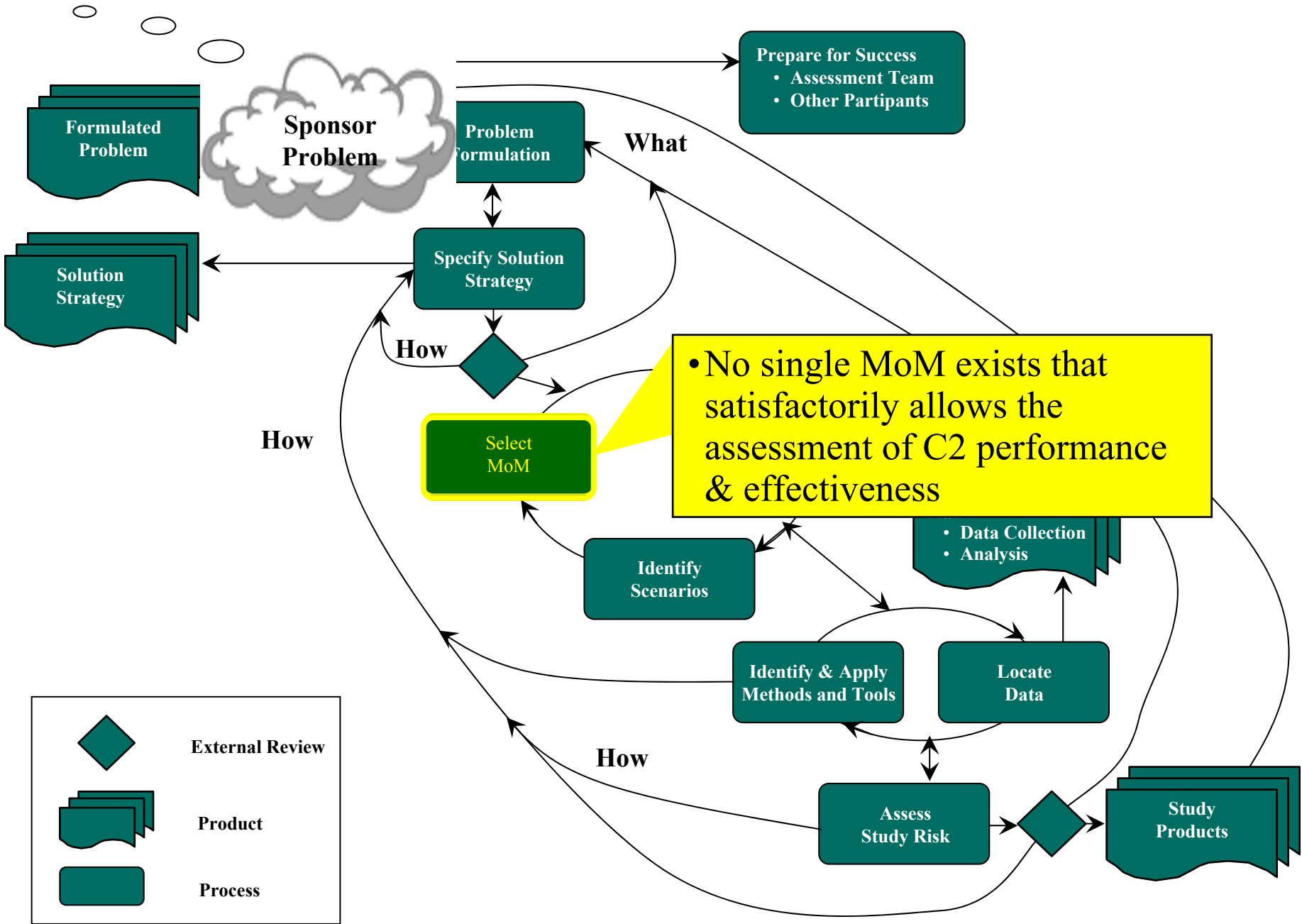
C2 Assessment Process (SAS-026)



C2 Assessment Process (SAS-026)

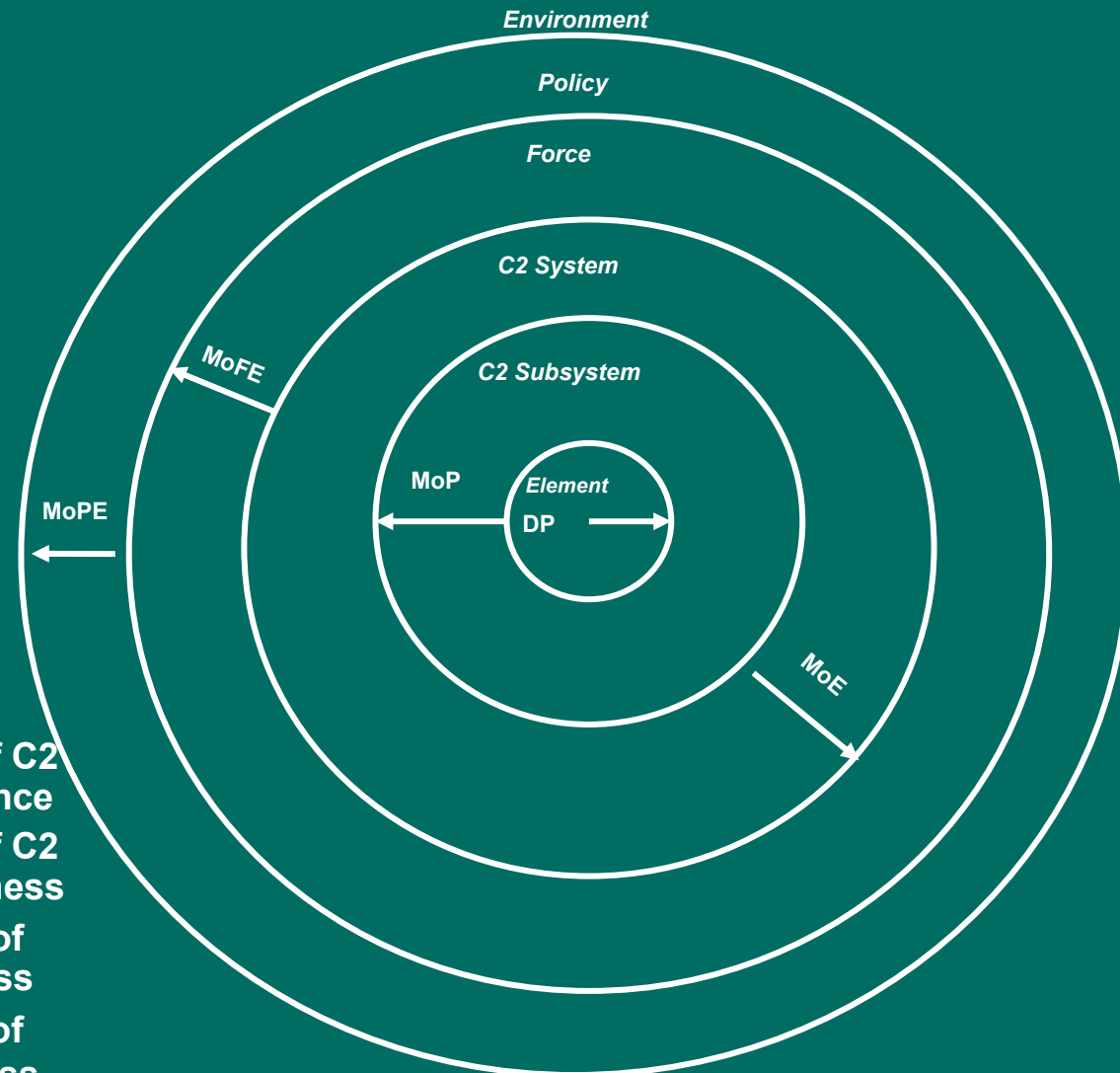


C2 Assessment Process (SAS-026)



C2 Assessment Process (SAS-026)

Relationships Among Classes of Measures of Merit



Legend

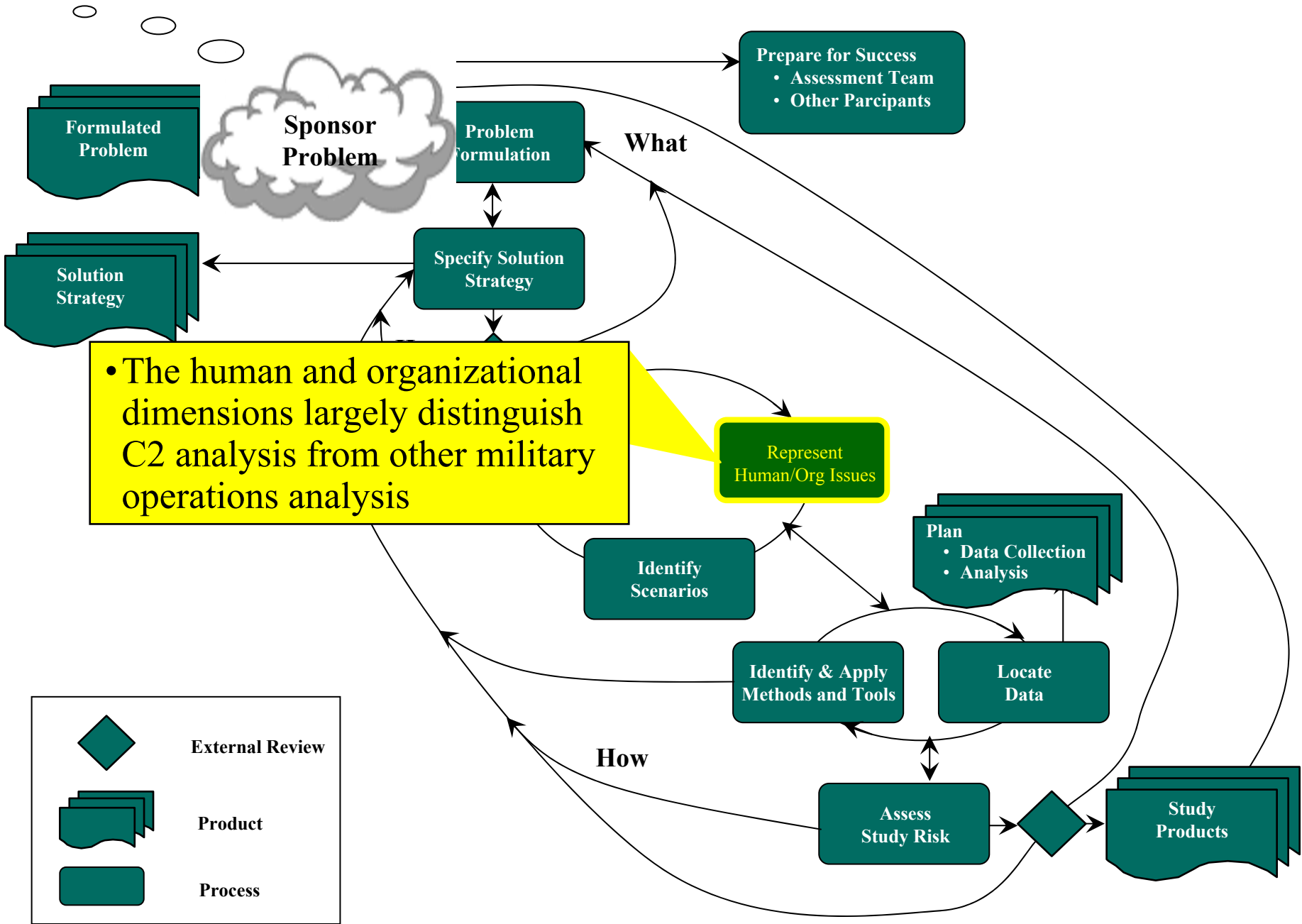
DP: Dimensional Parameters

MoP: Measures of C2 System Performance

MoE: Measures of C2 System Effectiveness

MoFE: Measures of Force Effectiveness

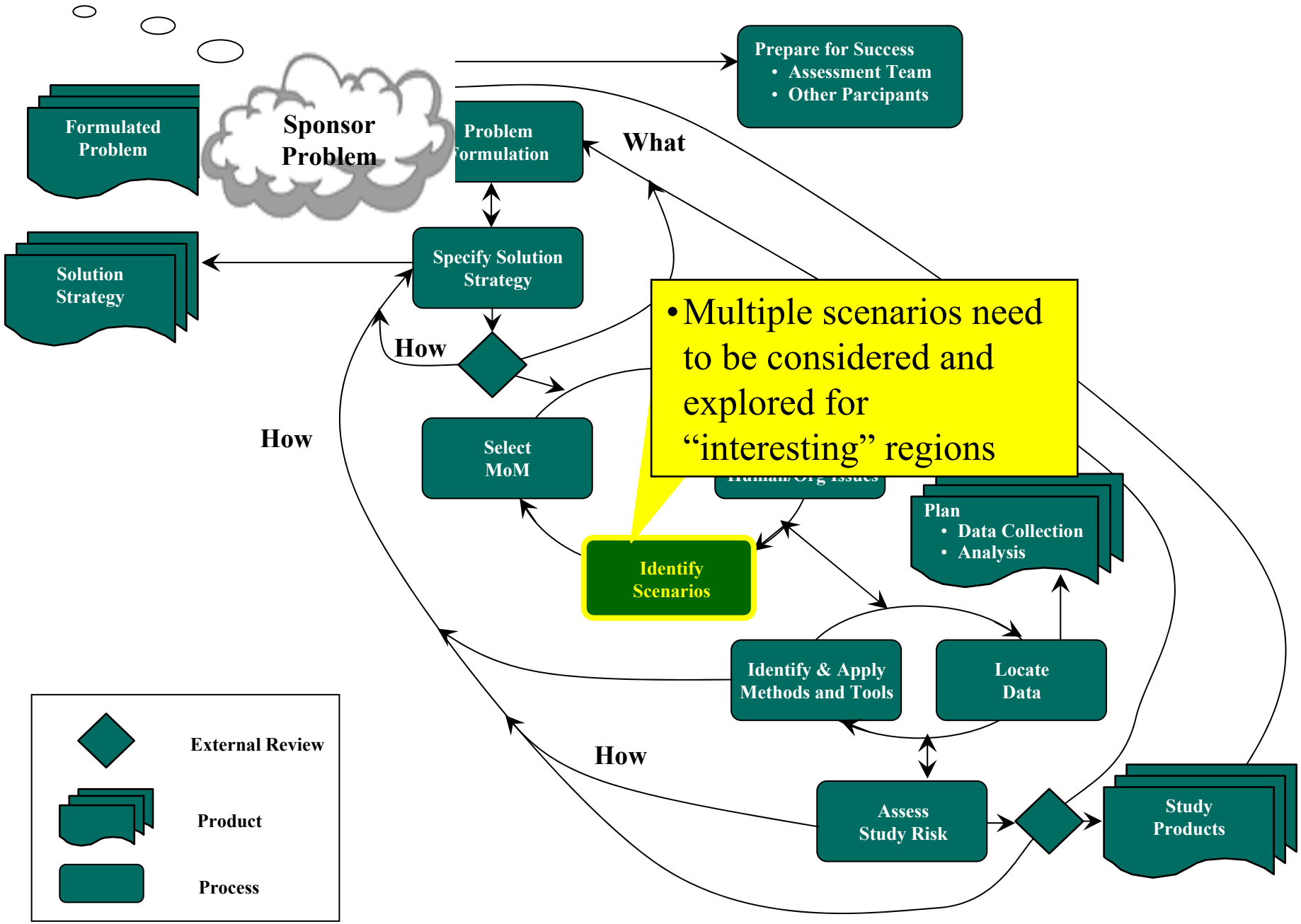
MoPE: Measures of Policy Effectiveness



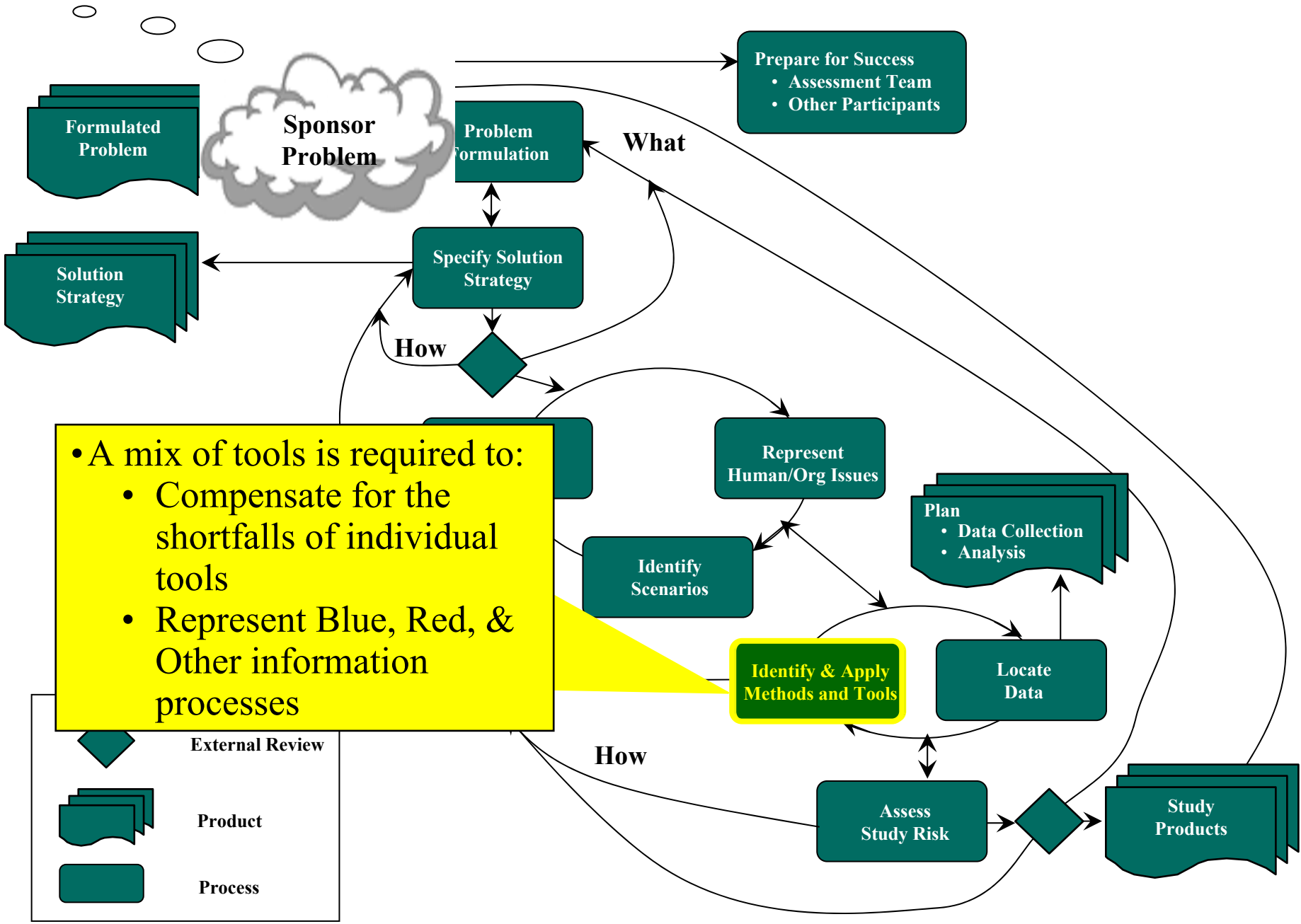
C2 Assessment Process (SAS-026)

Taxonomy of Human & Organizational Factors

- Human Factors
 - Human behavior (e.g., psycho-physiological; social/cultural)
 - Decisionmaking behavior (e.g., cognitive)
 - Command style
- Organizational Factors
 - Structural (e.g., span of control)
 - Functional (e.g., distribution of responsibility/authority)
 - Capacity (e.g., personnel, experience, training)



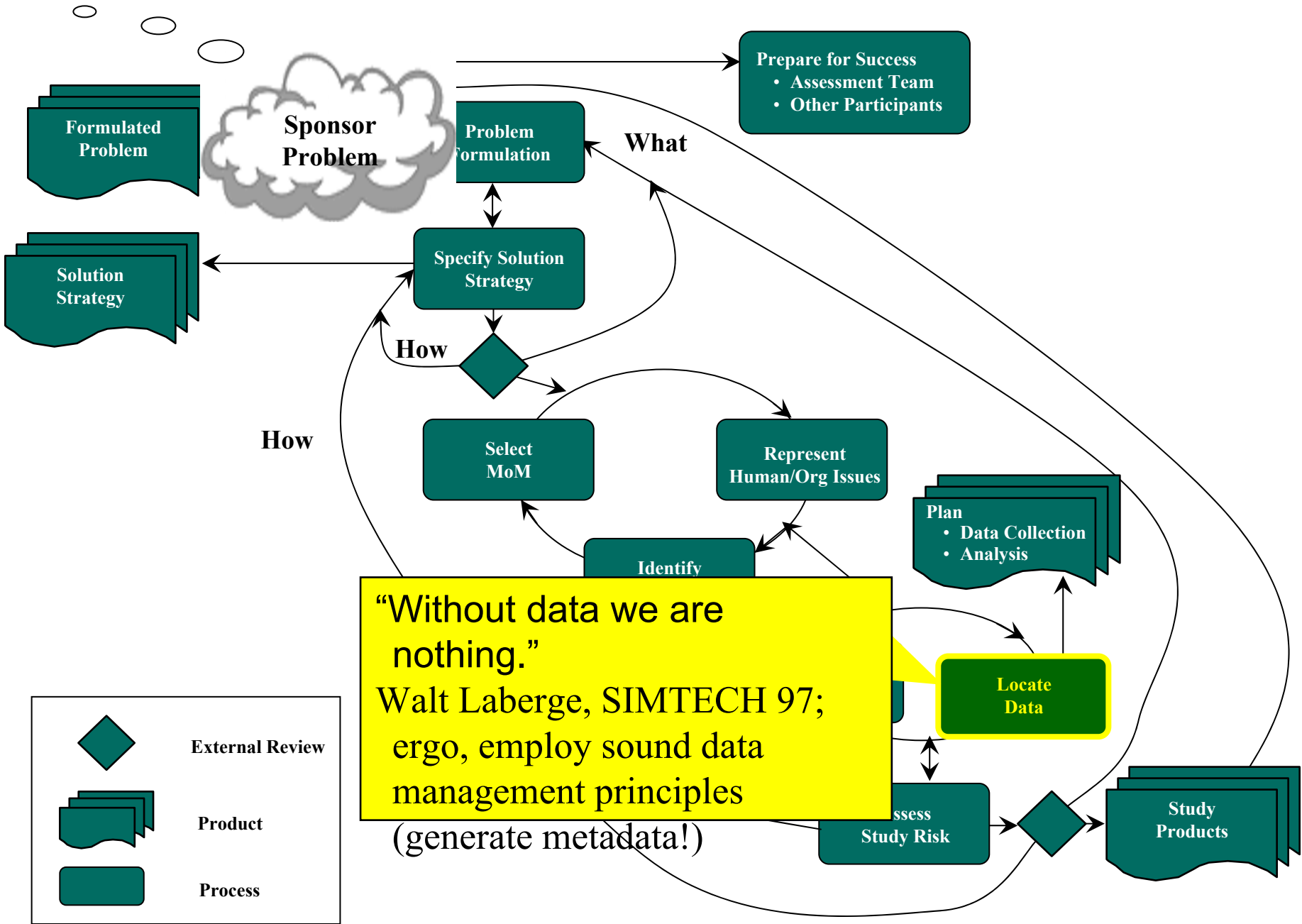
C2 Assessment Process (SAS-026)



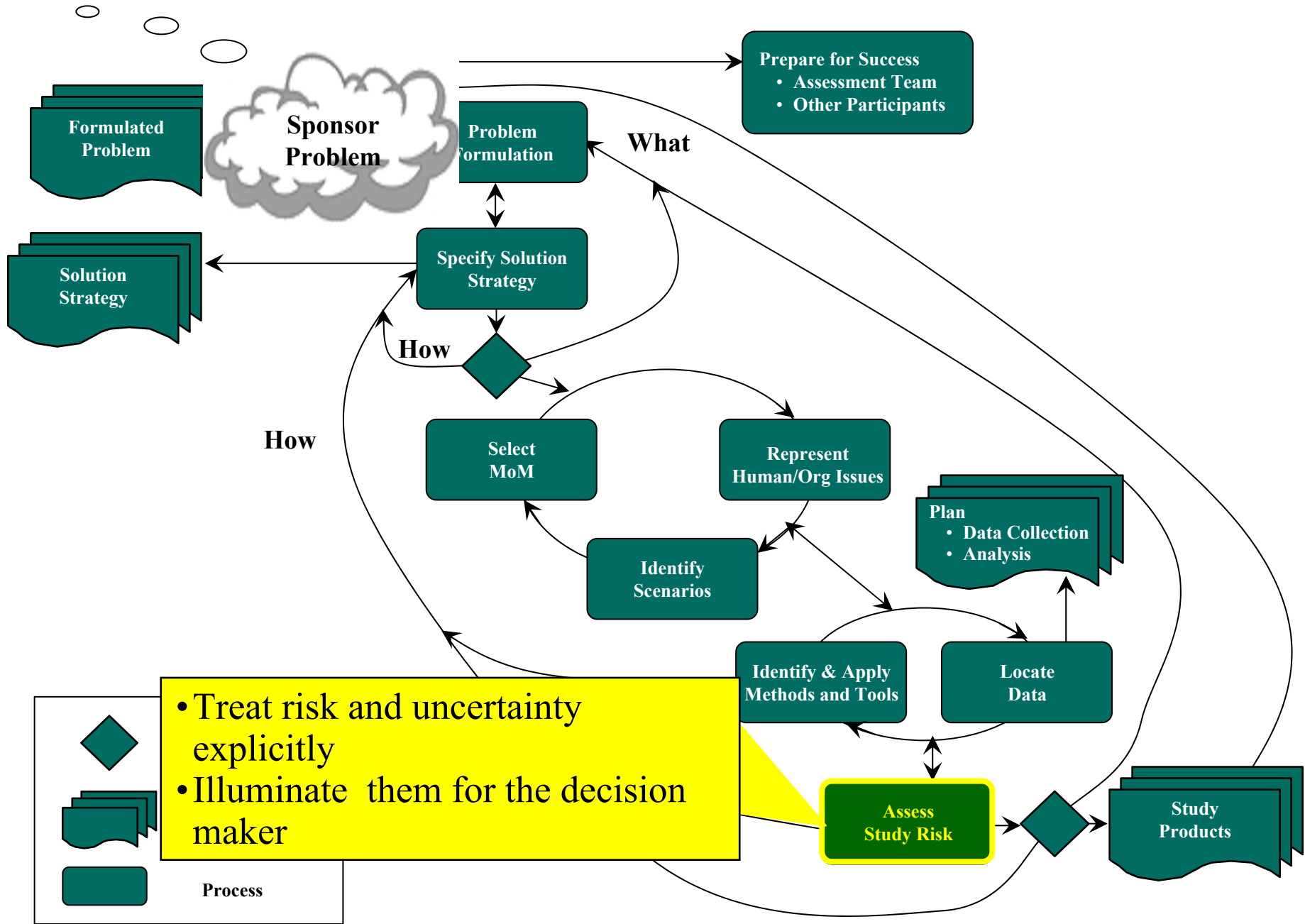
C2 Assessment Process (SAS-026)

Promising C2 Assessment Tools

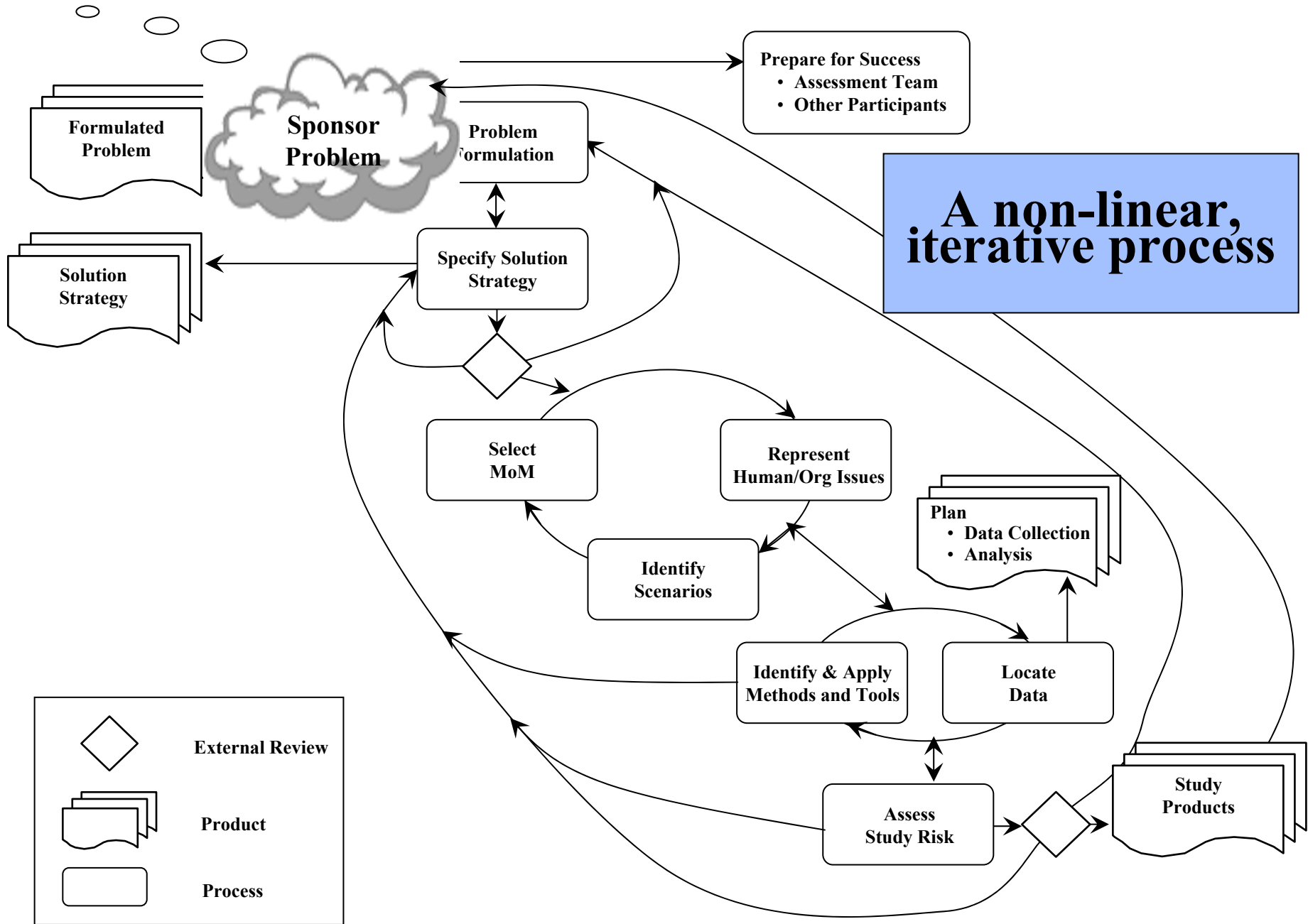
- “Soft” Tools
 - Expert elicitation (e.g., Situational Influence Assessment Module (SIAM))
 - Systems dynamics models (e.g., CAPE)
 - Effects based assessment (e.g., Causal Assessment Tool)
 - Agent based models, distillations (e.g., Mana, PAX)
- Constructive M&S
 - Systems-level (e.g., NETWARS)
 - Mission-level (e.g., Joint Conflict and Tactical Simulation (JCATS))
 - Theater-level (e.g., Joint Warfare System (JWARS))
 - Federations (e.g., Pegasus; architecture assessment linking models of combat, communications, and process (e.g., Bonapart))
- Virtual M&S
 - Analysis (e.g., Theater Air C2 Simulation Facility (TACCSF))
 - Acquisition (e.g., Massively multi-player, persistent virtual realities)
- Live M&S
 - Instrumented facility/range (e.g., National Training Center)



C2 Assessment Process (SAS-026)



C2 Assessment Process (SAS-026)

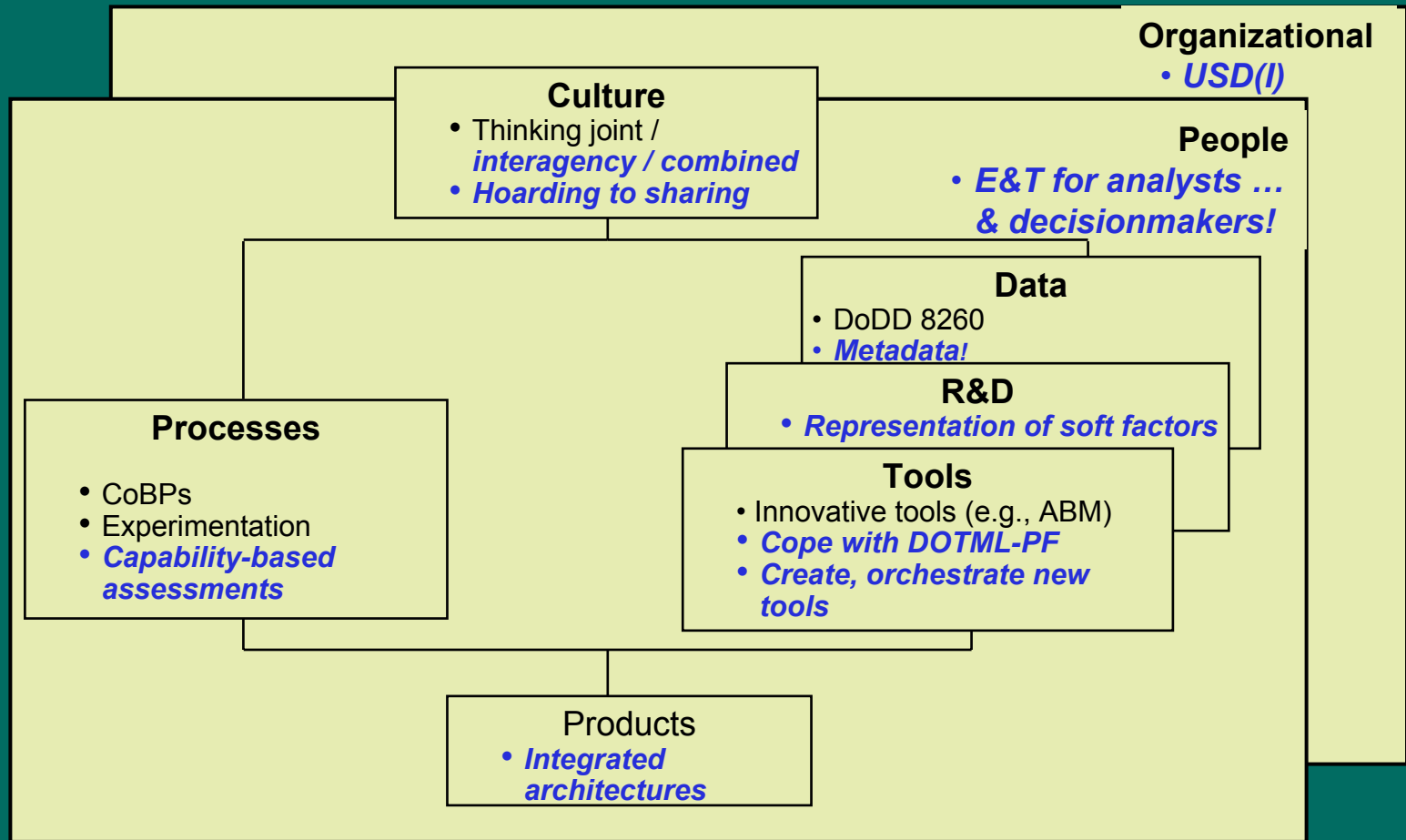


Summary

Agenda

- Looking Backward
- Recent Activities
- **Future**

Looking Ahead: Future C2 Assessment Challenges



Legend: - Advance
- *Challenge*

Final Observations

- If future C2 assessments are to be responsive to decisionmakers' needs, it will require
 - Enhancing *cross-community* communications; e.g.,
 - Organizationally (e.g., Services, Inter-agency, coalition)
 - User types (e.g., decisionmakers, technologists, analysts)
 - Systematically addressing *all* of the residual challenges cited, particularly in the areas of
 - Culture
 - Education & training
 - Data
 - Product creation

C2 Problems Tend to be Complex, Poorly Defined



“Vacuums, black holes, antimatter, C2 assessment —
It’s the elusive and intangible which appeals to me”