

# Explanation-Based Decision Making

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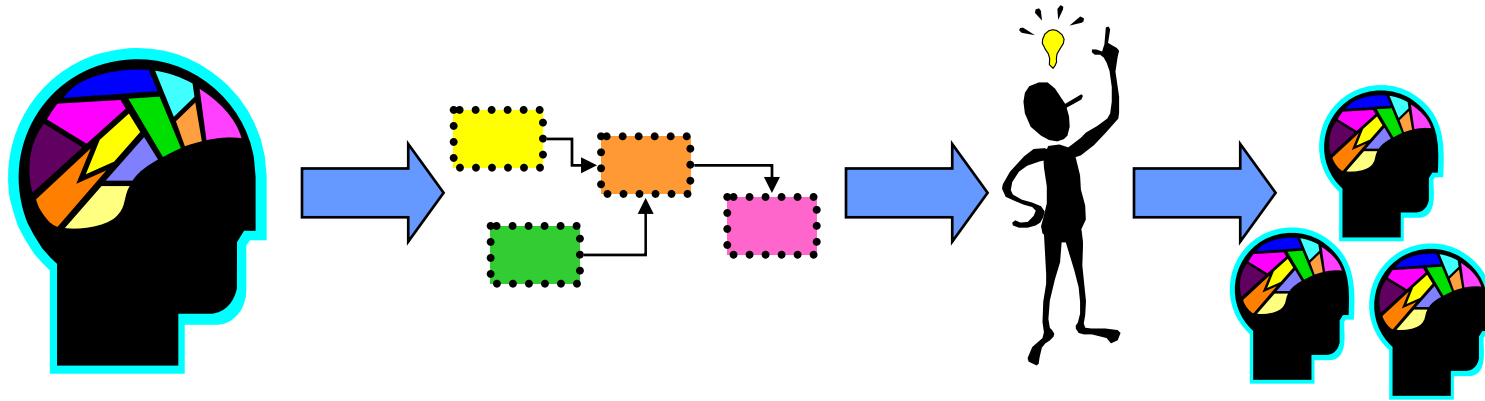
MITRE Sponsored Research



# Problem

- **Hypotheses** are typically expressed as assertions, but may have elaborate **explanations** or stories supporting them
- These **explanations** are often **tacit**—mental models maintained only in the human mind
- **Tacit explanations** are cognitively difficult to critique or evaluate, increasing the chance of **analytic judgment failure**

# Background



**Think**

**Externalize**

- Hypotheses
- Explanations
- Evidence
- Judgments

**Analyze**

- Models
- Gaps
- Questions
- Inconsistencies

**Share**

- Review
- Critique
- Revise

**Cognitive Support to Analysis**

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# Objective

- **Develop a systematic method** for explicitly representing and critiquing the explanatory stories underpinning analytic hypotheses
- **Implement a prototype** analysis-support environment following the principles of explanation-based decision making
- **Evaluate our method** empirically

# Activities

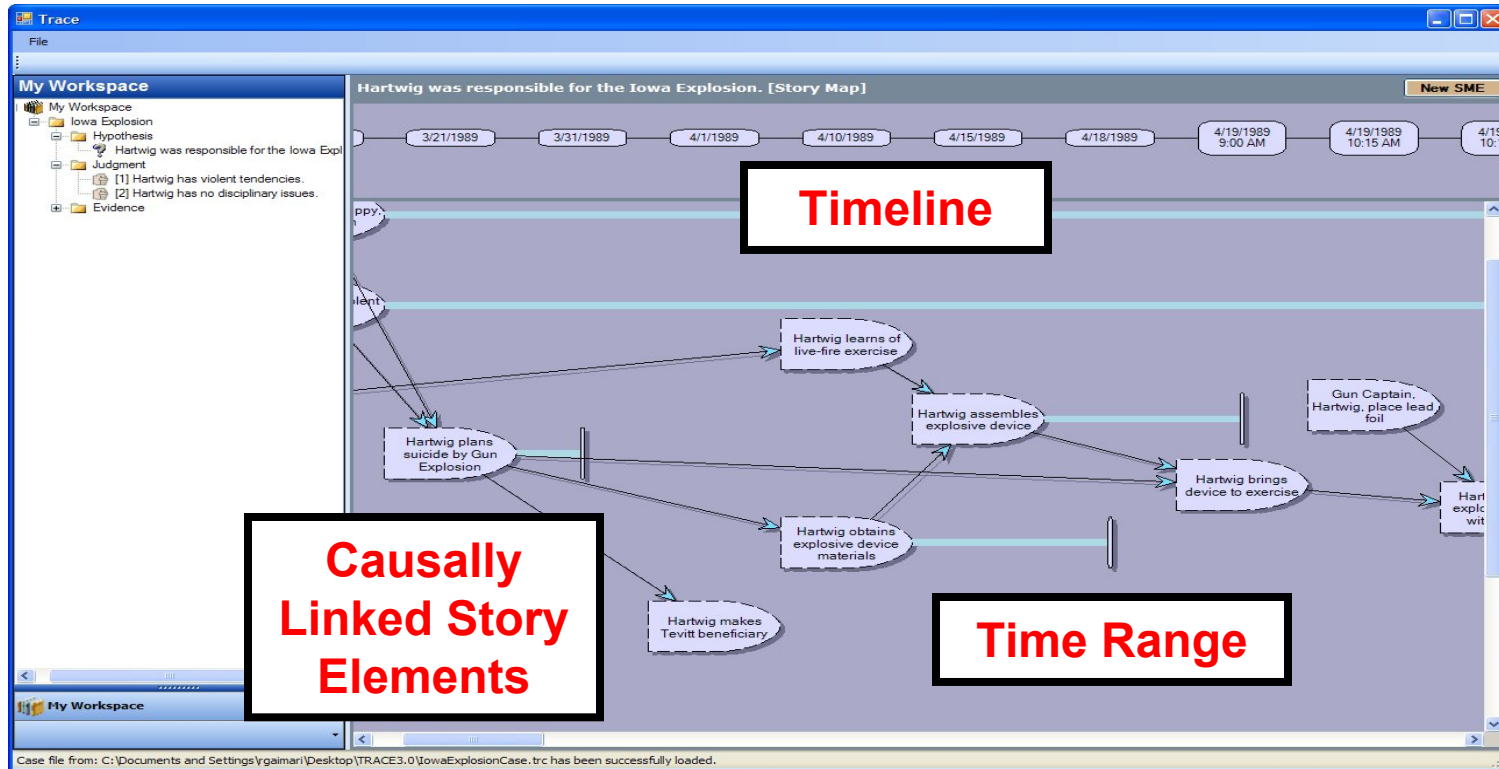
- Developed EBDM “story mapping” method
- Devised empirical evaluation strategy
- Implemented prototype analysis-support environment
  - Traceable Reasoning for the Analysis of Competing Explanations (TRACE)
- Coordinating with U.S. government partners on prototype design and testing plan

# Highlight

The screenshot displays the TRACE workspace interface. On the left, the 'My Workspace' tree shows a hierarchy for 'Iowa Explosion' with sub-items: Hypothesis, Judgment, and Evidence. The main area shows a 'Story Map' for the hypothesis 'Hartwig was responsible (sabotaged) for the Iowa Explosion'. The map includes a timeline with dates 3/21/1989 and 3/31/1989, and a central event 'Hartwig plans suicide by gun explosion.' A red box highlights this event with the text 'Story map for a hypothesis'. Below the map, the 'Story Element' section shows the label 'Hartwig plans suicide by gun explosion.' and details 'He was suicidal.' with date ranges from 1989-03-21 to 1989-03-31. At the bottom, two panels are visible: 'Supporting' evidence (e.g., '[7] The Chaplain aboard the Iowa told investigators H...') and 'Refuting' evidence (e.g., '[2] Hartwig has no disciplinary issues.'). A red box highlights these panels with the text 'Supporting evidence and judgments'. A white box with red text 'Sources of evidence' is positioned over the 'Evidence' list in the left pane. A status bar at the bottom indicates 'Saving Iowa Explosion to C:\Documents and Settings\mcasipe\Desktop\IowaExplosionCase.trc is successful.'

## The TRACE Workspace

# Demonstration



**Graphical Representation of Hypothesis “Story Map”**

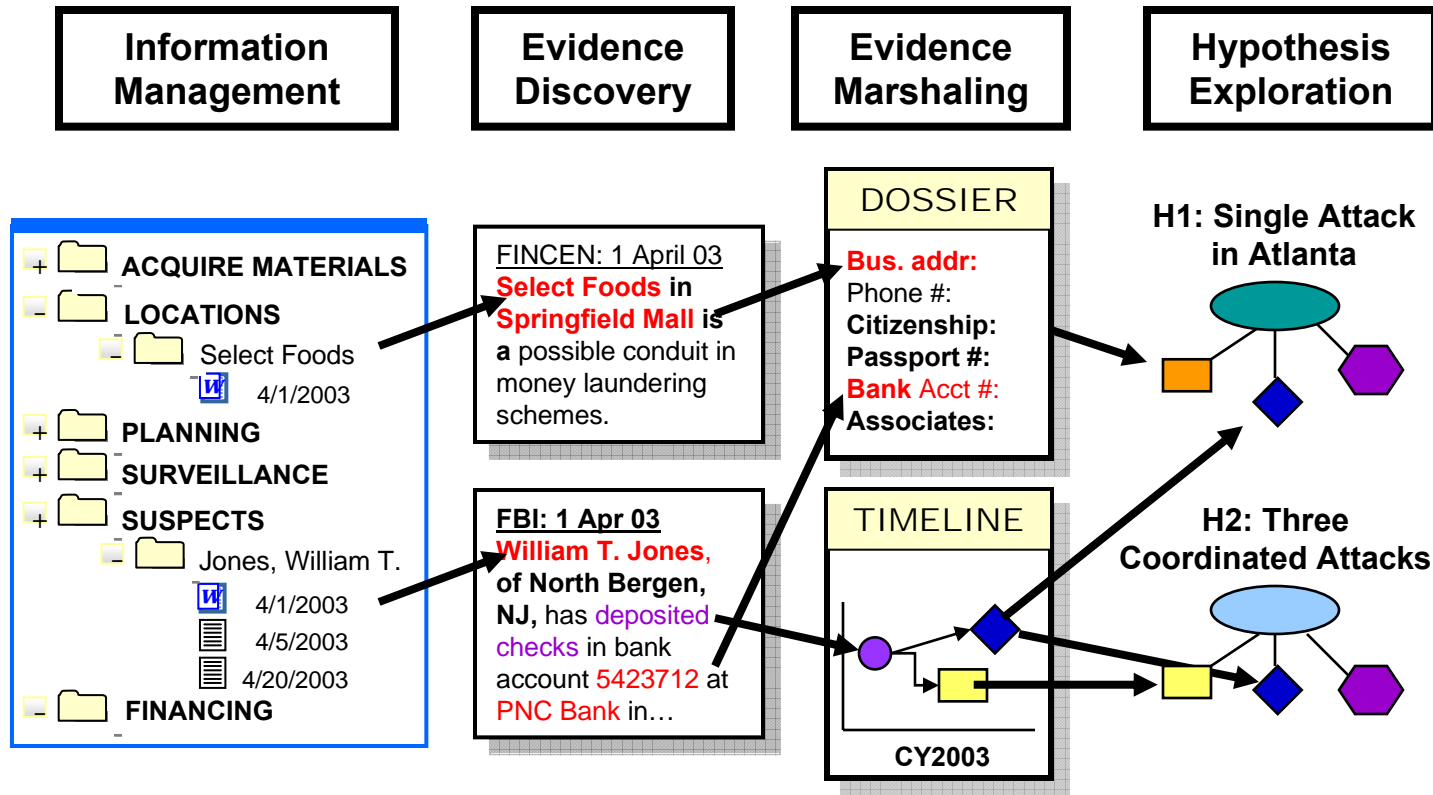
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# Impact

- **Contribution to growing research community interested in new and improved analysis methods**
- **Prototype demonstrating “story mapping” method for hypothesis generation and testing**
- **Empirical technique for evaluating analytic impact of story-mapping method**
- **New relationships with key Intelligence Community organizations and programs**

# Future Plans



**Future Vision: Traceable End-to-End Analysis Support**