

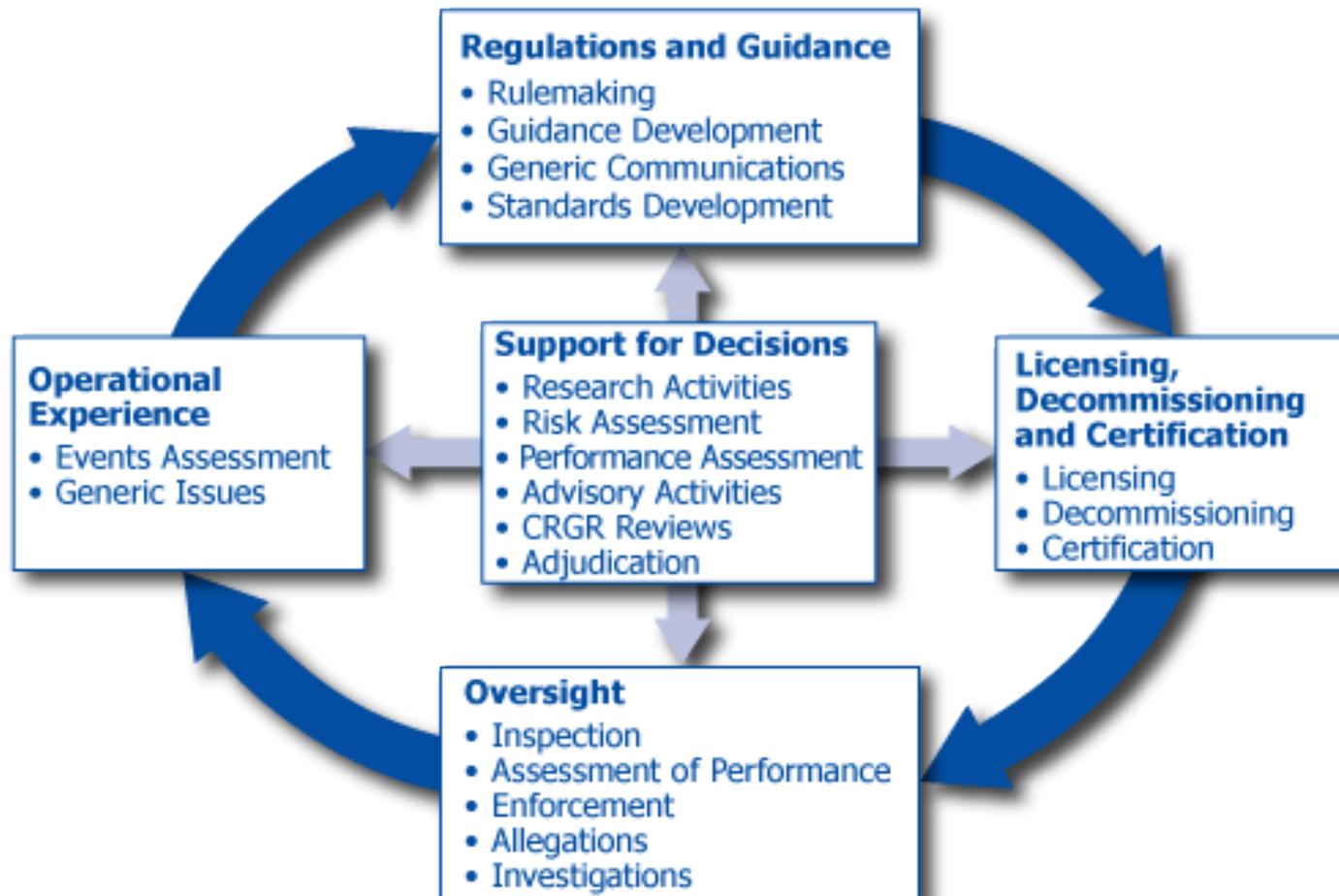


# **Knowledge engineering tools – an opportunity for risk-informed decision making?**

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# Increasing use of risk information...



# The challenge:



- Large (and increasing) amounts of information
- Changing organizational demands, including
  - More applications
  - Applications needing modeling extensions (with assumptions and limitations)
  - Use of absolute results
  - Incorporation of Fukushima Dai-ichi accident lessons
  - Changing staff demographics
- How to enable a broad range of users to efficiently and effectively access and use information?

# Wouldn't it be nice?

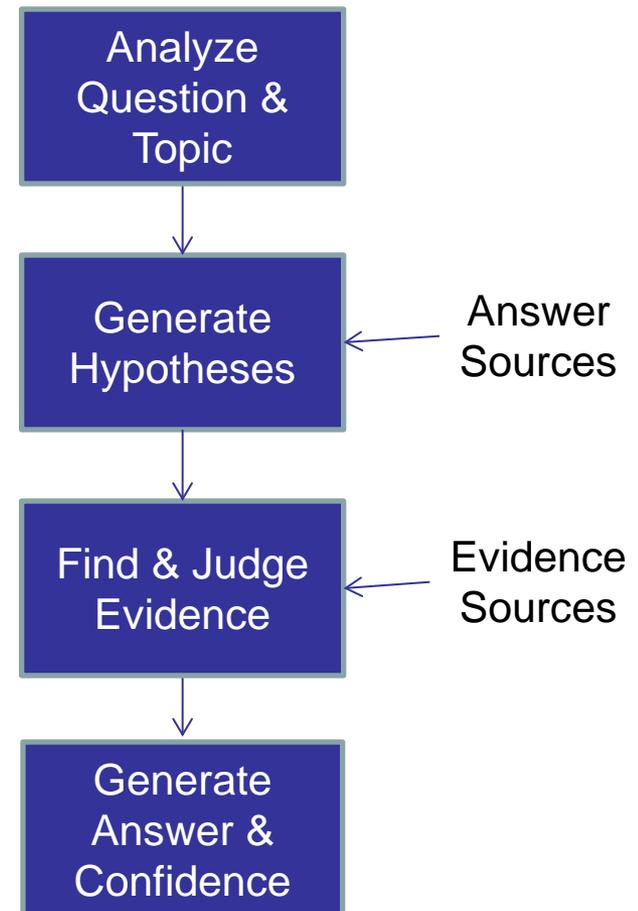
- What do we know about the CDF for plants with characteristics X, Y, and Z? What are the dominant contributors and why?
- What was the basis for criterion Q?
- How can system W fail?
- What are the key differences between these two models?
- etc.

- Natural language
- Dynamic exploration
- Broad yet reliable information base

**A hint: “\_, come here I want you.”**



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# Watson's challenges

- Natural language
  - Ambiguity
  - Context-dependence
  - Implicitness
  - Non-uniqueness
- Supporting data
  - Unstructured
  - Volume
  - Varying trustworthiness
- Common Jeopardy! add-ons
  - Word play, subtle meanings, riddles

Category: US Cities

**ITS LARGEST AIRPORT  
IS NAMED FOR A  
WORLD WAR II HERO;  
ITS SECOND  
LARGEST, FOR A  
WORLD WAR II BATTLE**

# What's available today?

- Increasingly powerful searches
- Text analytics: analyze unstructured text to extract key information
- Content analytics: text analytics + mining
  - Word (and synonym) counts
  - Correlations, patterns, trends
  - Various display formats to highlight relationships
- Formal modeling (e.g., OpenPSA)

# Not just computer science

- Subject matter expertise needed in:
  - Problem specification
  - Glossaries, rules, concepts
  - Analyses and improvements
- Need to avoid:
  - Black box
  - The Oracle
- Need to make efficient use of experts

# NRC Activities

- Long-term research project
  - FY 2014 scoping study: is further work warranted?
  - Focus on content analytics, risk information
    - Needs of prototypical users
    - Current solutions
    - Areas for potential improvement
    - Knowledge engineering tools that might be useful
    - Demonstration analyses
    - Overall assessment
- Broader exploration by Office of Information Services

# Summary

- NRC's risk-informed activities could benefit from ongoing developments in knowledge engineering
- NRC is planning to initiate a scoping study exploring the benefits of currently available content analytics tools