OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

Metaphor Program Proposers' Day
Office of Incisive Analysis

L E A D I N G   I N T E L L I G E N C E   I N T E G R A T I O N

Dr. Heather McCallum-Bayliss
April 13, 2011

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

L E A D I N G   I N T E L L I G E N C E   I N T E G R A T I O N

Disclaimer

- This presentation is provided solely for information and planning purposes.

- The Proposers' Day Conference does not constitute a formal solicitation for proposals or proposal abstracts.

- Nothing said at Proposers' Day changes the requirements set forth in a BAA.

- BAA supersedes anything presented or said at the Proposers' Day by IARPA.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Proposers' Day Goals

- Familiarize participants with IARPA's interest in the exploitation of the use of metaphorical language to gain insights into understanding culture.

- Please ask questions and provide feedback. This is your chance to alter the course of events.

- Foster discussion of synergistic capabilities among potential program participants, AKA teaming. Take a chance; someone might have a missing piece of your puzzle.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Proposal Schedule

- Full proposals are due approximately 60 days after the BAA is published.

- We will not use a white paper process.

- Once the BAA is released, questions can only be answered in writing on the program website.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Program Overview and Goals

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Program Goals

Exploit the use of metaphorical language to gain insights into underlying cultural beliefs…

by developing and applying a methodology that automates the analysis of metaphorical language.

Glossary of Program Terms (1)

- Culture is a set of values, attitudes, knowledge and patterned behaviors shared by a group.   It can be transmitted through symbols (e.g., language) and social interaction.

- Metaphorical language
  - A traditional metaphor is a poetic or rhetorical device in which a word or phrase is used to refer to something that it does not literally denote in order to suggest a similarity. It is generally of the form X is Y: *The world is a stage.*
  - More recently, metaphors have been shown to be pervasive in everyday talk and to reflect underlying concepts that people share. The instances of the use of metaphorical language are called *linguistic metaphors* (e.g., *You have to find your own way; she was at a crossroads*).
  - The linguistic metaphors are realizations of the underlying pattern or *systematic* association of *abstract concepts* (i.e., the *target*) with *concrete concepts* (i.e., the *source*). These associations are called *conceptual metaphors.*

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Glossary of Program Terms (2)

- – The *source* of the metaphor is the domain from which we draw metaphorical expressions (e.g., Life is a *journey)*. They are generally concrete and related to bodily and life experiences. The *target* is the domain that we are trying to understand (e.g., *Life* is a journey) .   Targets are generally psychological/mental states, social groups/processes and personal experiences/events.
- – The relationship between the target and the source is defined by mapping principles. These mappings describe analogical reasoning and inference processes.

- Metonymy is the use of a name for an item based on an association of a feature of the item with the whole, e.g., The ham sandwich at Table 2 needs another cup of coffee. Metonymy may be used in some cultures as a device similar to metaphor.

Target Use Case

- **Understanding the shared concepts and patterned behaviors of a culture** is a significant challenge because cultural norms tend to be hidden. Even cultural natives have difficulty defining them. Having a system that could discover and structure cultural beliefs and perspectives would be valuable to novice and seasoned IC analysts alike.

- An analyst needs to know the worldviews of the various cultures that she deals with. She presents a cross-cultural problem to the Metaphorical Language Analysis System to gain an understanding of the contrasting perspectives of the parties involved. The system offers two capabilities to the analyst. One will show cultural contrasts in the metaphors used for abstract and social concepts: Life is a Game vs. Life is a Struggle.

- The second will present a structured representation of the metaphors that expose insight into the views and goals of the protagonists in the situation.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Nature of the Problem

- Surveys are frequently used to identify "cultural beliefs" but they reflect *conscious* knowledge.

- Surveys can be very expensive and time-consuming to implement. Development of larger surveys can require 12-18 months.

- The accuracy of the participants' contributions is not certain. Responses may suffer from conscious or unconscious interference (e.g., respondent is trying to please the questioner). Persons may refuse to participate, which can result in sample bias. Populations may be illiterate and may not be familiar with surveys, which can also prejudice the results.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

State of the Art (1)

- Metaphors have been known since Aristotle (*Poetics*) as poetic or rhetorical devices that are unique, creative instances of language artistry (e.g., The world is a stage). Over the last 30 years, metaphors have been shown to be pervasive in everyday language and to reflect cultural beliefs.

- Metaphors shape how people think about complex topics and can influence beliefs.

    A study presented participants with a report on crime in a city; they were asked how crime should be addressed in the city. The report contained statistics, including crime and murder rates, as well as one of two metaphors, CRIME AS A WILD BEAST or CRIME AS A VIRUS. The participants were influenced by the embedded metaphor – recommending more police and jails vs investigating the root cause and establishing community programs.

- Human communication theorists have adopted metaphor for message- and image-formation.

- Metaphors are associated with affect; affect influences behavior. This association has been confirmed through neuro-science experiments.

- Metaphors can reduce the complexity of meaning associated with a topic by capturing or expressing patterns.

State of the Art (2)

- Research on metaphors has uncovered inferred meanings and worldviews of particular groups or individuals: Characterization of disparities in social issues and contrasting political goals; exposure of inclusion and exclusion of social and political groups; understanding of psychological problems and conflicts.

- Automated tools and techniques have addressed various aspects of the metaphor analysis process. This is the appropriate time to exploit and expand these technologies.
    - Defining mapping principles and metaphorical meaning using ontology- and corpus-based approaches.
    - Identifying syntactic patterns in written text indicative of metaphors.
    - Semantic annotation to identify candidate "source" and "target" domains and patterns of metaphor.
    - Correlation of specific types of metaphors with particular topics and narratives.

- The significant amounts of data now available on-line from many cultures can be a rich source for identifying cultural beliefs.

Role of Women
Women are property.
Woman is only a caregiver.
A woman's place is in the home.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Program Structure

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Approach

To be able to answer analysts' questions about the tacit beliefs of cultures and sub-cultures,

we must first develop a methodology for *automating* the discovery, framing* and categorization of linguistic metaphors in large amounts of textual data in multiple languages.

The program will have two phases of 30 and 24 months.

* A semantic schema or representation of the metaphor; also referred to as *mapping*.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Program Features

Teams

- Multidisciplinary teams required (e.g., (social) psychologists, experience with metaphorical language research, NLP, cultural analysis, semantics/ontologies)

- Multilingual and multicultural capabilities

Data

- Performers will gather large amounts of data for development in the native language. English translations are not acceptable.

- The approach to data selection must be defined in the proposal: method of selection, source, sub-culture (if known), data type, justification and relevance of the data to the discovery of cultural beliefs.

Languages/ Cultures

- Tasks will require analysis in multiple languages and diverse cultures

Metaphor Repository

- Performer teams will design, develop and capture all metaphors, associated semantics and uses.

- Multiple examples of linguistic metaphors are required.

Metaphor Targets and Case Studies

- Concepts for metaphorical analysis in Phase 1 will be abstract concepts and social issues.

- Case studies (for Phase 2) will represent contrastive views of world events and validation or refutation of stated beliefs.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Phase 1

Automating Metaphorical Language Analysis

Data Gathering

Discovery of Linguistic Metaphor Examples

Semantic Framing and Categorization of Metaphors
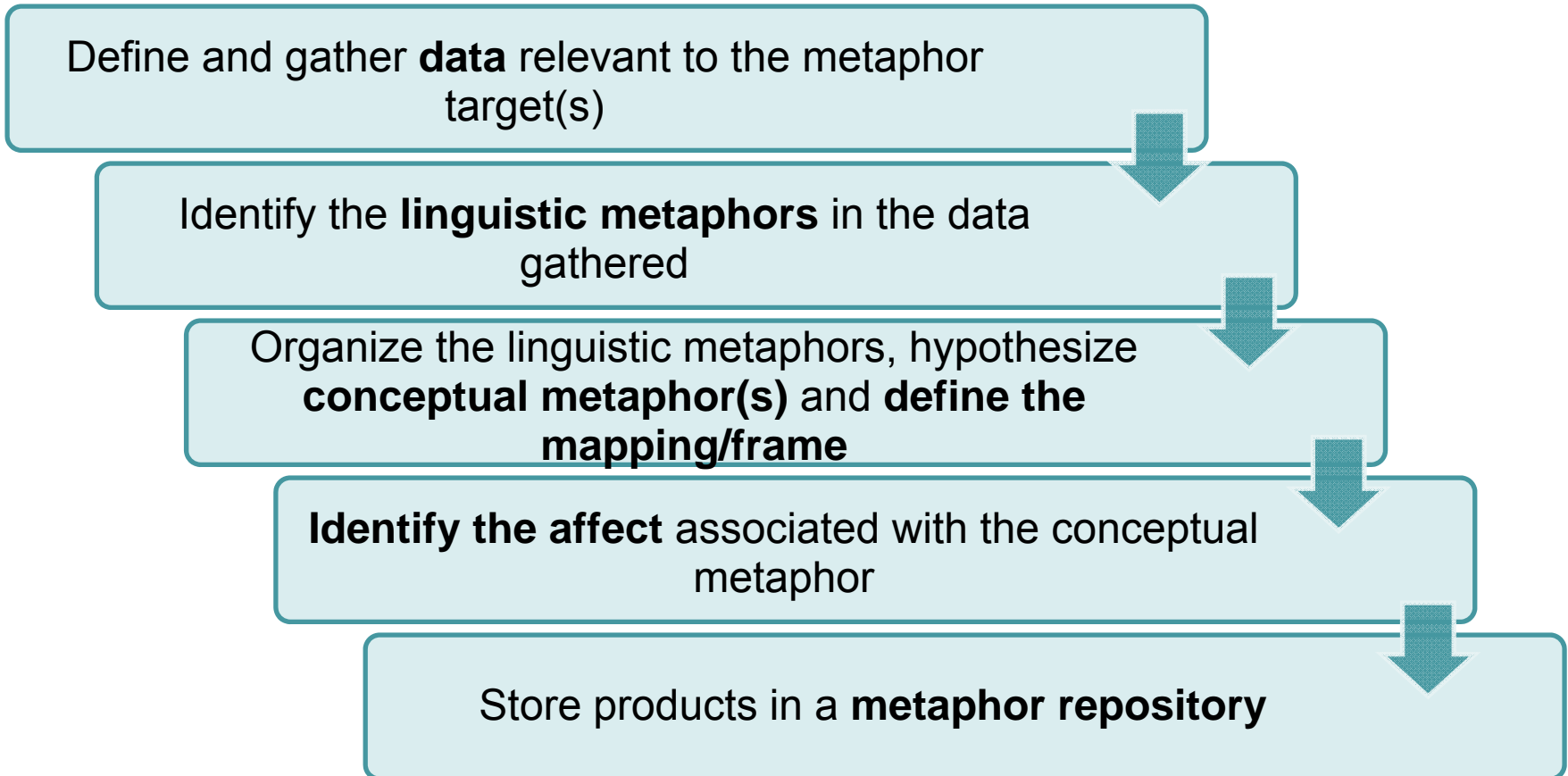
Storage of All Metaphors with Evidence in Repository

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Phase 1 Process [1]

Performers will define and automate the following process:

Define and gather **data** relevant to the metaphor target(s)

Identify the **linguistic metaphors** in the data gathered

Organize the linguistic metaphors, hypothesize **conceptual metaphor(s)** and **define the mapping/frame**

Identify the affect associated with the conceptual metaphor

Store products in a **metaphor repository**

The goal is to have an automated process and prototype system.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Notional only

Phase 1 Process (2)

Metaphor Target

→

Massive Data
- Multilingual
- Performer gathered

→

Gather Linguistic Metaphors

→

Mapping/Frame

→

Metaphor Repository

Life

Context 1
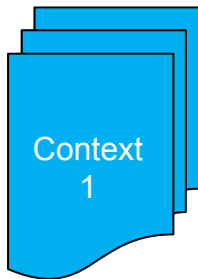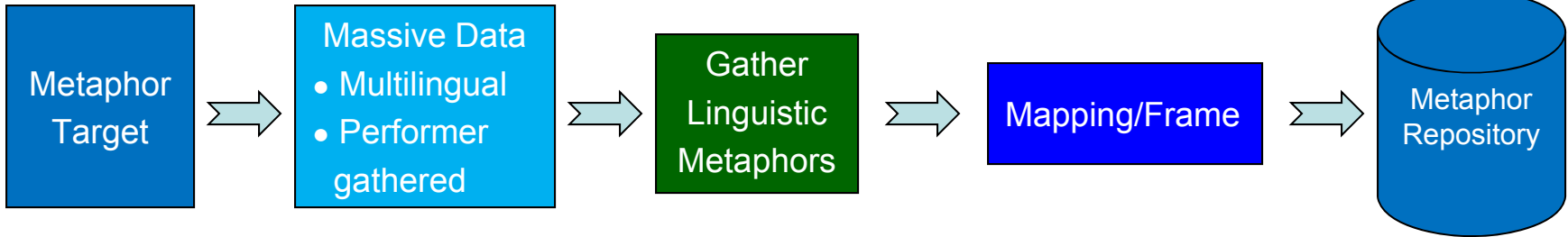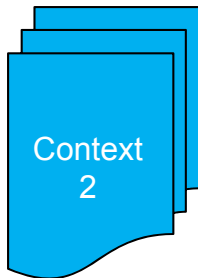
You have to find your own way.
That was the road not taken.
She was at a crossroads.
He is really going places.
Unfortunately, his life took a left turn.
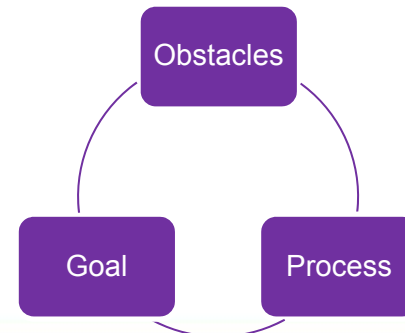
Decision Points

Physical Path

Movement

Direction
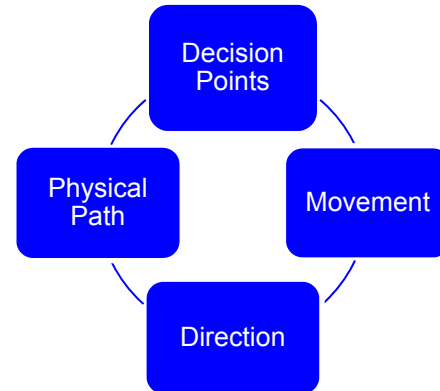
Journey

Affect: Neutral

Context 2

You have to fight for what you want.
Without struggle, there is no progress.
Change comes through struggle.
They're on a sinking ship with no lifeboat.

Obstacles

Goal

Process

Struggle

Affect: Negative

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Phase 2

Case Study Analysis

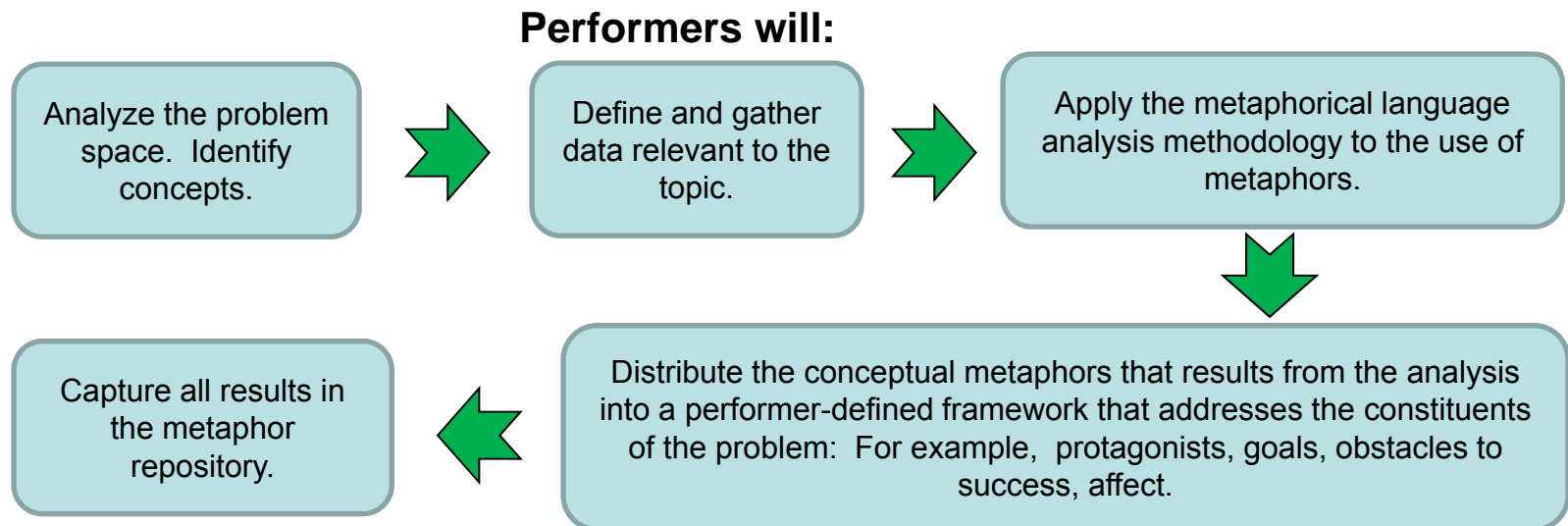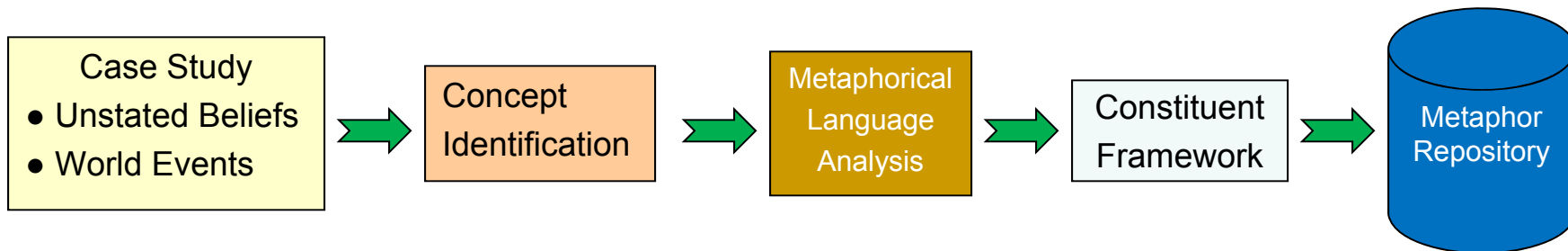| Analyst's Problem Statement | Underlying Concept Identification | Metaphorical Language Analysis | Metaphor Framework of Problem |

Phase 2 Process (1)

- Case studies will yield metaphors that are specific to the case studies as well as metaphors general to the culture. The domain can condition the metaphors used.
- Types of case studies to be addressed:
  - Contrastive views of world events (e.g., PRC and Taiwan; Israel and Palestine)
  - Validation or refutation of stated beliefs (e.g., Chavez)

Performers will:

| Analyze the problem space. Identify concepts. | ➡ | Define and gather data relevant to the topic. | ➡ | Apply the metaphorical language analysis methodology to the use of metaphors. |

⬇

| Capture all results in the metaphor repository. | ⬅ | Distribute the conceptual metaphors that results from the analysis into a performer-defined framework that addresses the constituents of the problem: For example, protagonists, goals, obstacles to success, affect. |

Notional only

Phase 2 Process (2)

```
Case Study          →    Concept         →    Metaphorical      →    Constituent      →    Metaphor
● Unstated Beliefs       Identification       Language               Framework            Repository
● World Events                                Analysis
```

Analyst's question
• What are the perspectives of Pakistan and India with respect to Kashmir?
Context

• Role of Britain
• Nation
• Government
• ….

| Protagonists |
| Goals |
| Obstacles |
| Affect |

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Notional Only

Example of Constituent Framework

An international organization, International Help (IH), contracted and worked with a company in South Mondolo, Educational Advancement Associates (EAA), to develop new educational materials and curricula for the schools in the northern region. In order to complete the work, IH has set up workshops to "train the trainers." Once they have been trained, the EAA personnel can then go to the northern region and train the local school staff. The workshops are complete but it is clear that the EAA trainers do not intend to take on the additional task of training the school personnel. IH personnel cannot understand this resistance to doing the job at the local level, because training the local teachers will complete the project.

Why are the trainers uncooperative? Why did EAA agree to the contract if their staff will not do what is necessary to complete the work?

	CONCEPTUAL METAPHORS	
	International Help	Educational Advancement Associates
Protagonists	Work is a Movement toward a Target Success is Hitting the Target	Work is a Recipe to be Followed Change is Work Redefinition
Affect	Frustration	Distrust

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

NOT Included in the Program

- Attitudes and opinions: **Not** opinion mining, sentiment analysis, viral spread of information

- Data: Program will focus on large amounts of text; creative and clearly defined ideas about what resources will be valuable and fruitful are required.
  - **Not** advertising; not marketing products
  - **Not** graphics, photos, video
  - **Not** non-verbal communication
  - **Not** speech (i.e., audio)

- Figurative Language
  - The only types of figurative language that are included in the program are metaphors and metonymy.
    - Metonymy will be in addition to metaphors. Those interested in metonymy must explain why metonymy is required and what metonymy adds to the analysis.
    - The metaphor repository must include any metonyms that are explored and must be designed to differentiate them from the metaphors.

- Goals
  - The program will discover and formulate linguistic and conceptual metaphors but it is not based on any specific theory nor on the cognitive status of conceptual metaphors.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Program Evaluation and Metrics

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Evaluation (1)

Three evaluation tasks, testing different aspects of the project, are anticipated.

1) Each metaphor in Phases 1 and 2 (conceptual metaphor, frame and affect) must be evaluated by the performer teams using valid social science methods. For example, experimental design informed by priming, retelling, message framing.

- Experts in the methodology of testing will review and evaluate the protocols and results.
- The Government team will engage a team of IC analysts to evaluate the quality and utility of the system output at the various stages of the metaphorical analysis.

2) The Government team will undertake a thematic analysis to validate the distribution of the conceptual metaphors in the constituent framework of the case study.

- Thematic analysis is a qualitative approach to data analysis. Data are gathered using qualitative methods, such as structured interviews or focus groups. The resulting data are analyzed to identify common themes. Experts in the methodology of testing will review and evaluate the protocols and results.
- In-country native speakers of a language will be the subjects.
- An expert panel selected by the Government team from various disciplines (e.g., cognitive linguist, sociolinguist, social psychologist, cultural anthropologist) will compare the constituent elements resulting from the metaphor analysis with the themes from the thematic analysis.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Evaluation (2)

3) Growth in the analyst's understanding of the case study problem will be evaluated.

- Pre- and post-thematic analyses
  - Conduct a structured interview of the analysts interested in the case study before the case study analysis is performed; undertake a thematic analysis. Conduct a structured interview of the analysts after they have examined the case study results and perform a thematic analysis. Compare the thematic analysis results to assess the analysts' enhanced insights into the problem.

- Administer an additional structured interview to gather information on the analyst's perception of the value of the case study results.
  - Structured framework
    - Does the structured framing of the concepts improve your understanding of the dimensions of the problem? Does it crystallize your understanding?
  - Value of the results
    - Do the case study results offer possible actions or approaches or concepts not previously considered?

Metrics (1)

Phase 1

- Target accuracy metrics.
  - Using the valid social science methods, teams will demonstrate that the conceptual metaphor and its semantic components (in the frame) reflect native-speaker knowledge of the metaphorical relations.
    - Metaphor analysis and metaphor validations (using valid social science methods) complete at 12 months (65%), 20 months (75%) and 24 months (80%).
    - Performer metaphor validation protocols will be subject to expert review at 11, 19 and 23 months.
  - Analysts will evaluate the quality of the output.

- Metrics measuring the timely completion of activities for the Phase 1 challenge problem. (5 months)
  - Performer metaphor validations will be subject to expert review.
  - Analysts will evaluate quality of the output.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Metrics (2)

Phase 2

- Target accuracy metrics.
  - Performer metaphor validations (at 8 months (65%), 14 months (75%) and 18 months (80%)) will be subject to expert review.
  - An expert panel will judge whether or not the case study metaphors correspond with the themes identified in the thematic analysis at 8, 14, 18 months with the goal of 80% of conceptual metaphors correspond with themes from thematic analysis.
  - An analysis of the outliers (i.e., disagreements) will focus on identifying additional semantic issues and framing.

- Evaluation of increased analyst knowledge.
  - Final goal: a 20% increase in the themes identified in the post-thematic analysis of the analyst's output over those themes identified in the pre-thematic analysis of the analyst's output.

- Metrics measuring the timely completion of activities for the Phase 1 challenge problem. (5 months)
  - Performer metaphor validations will be subject to expert review.
  - Validate constituents using themes from thematic analysis
  - Analysts will evaluate quality of the output.

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Programmatics

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Milestones

Phase 1: Methodology
1) Kickoff
2) Metaphorical language analysis (3 targets)
3) Analysis and evaluation of metaphors complete (12, 20, 24 months)
4) Knowledge Base definition, development and population
5) Challenge problem: metaphor analysis and evaluation complete
6) Prepare deliverables

Phase 2: Case Studies
1) Kickoff
2) Case studies (3 case studies)
3) Analysis and evaluation of metaphors complete (8, 14, 18 months)
4) Knowledge Base enhancement
5) Challenge problem: metaphor analysis and evaluation complete
6) Prepare deliverables

Phase 1			Phase 2	
Year 1	Year 2	Year 3	Year 4	Year 5
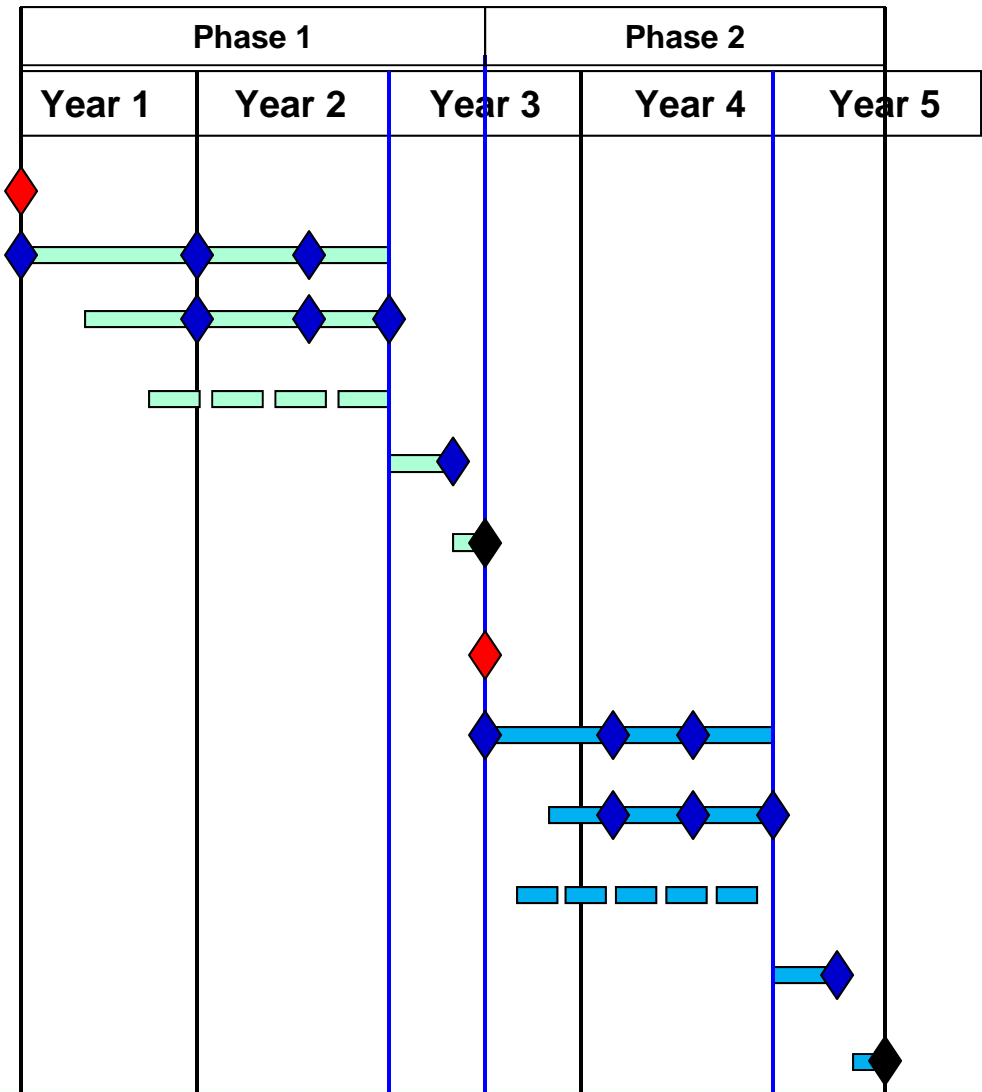
Program Deliverables

- The outcome of the program is NOT a fully engineered system but a methodology, tools and a prototype that could be used as the basis for a system in the future.

    - The teams will deliver a functional prototype that demonstrates the automated handling of data, discovery and semantic definition of metaphors.

    - Teams will produce and deliver a formal description of the methodology and tools developed for the metaphorical language analysis and their application to case studies. This will include a formal description of the constituent framework design and functions that results from the case study analysis.

    - The teams will develop tools and techniques for the various stages of the metaphorical analysis, deliver the tools to the Government and describe their application to the stages of the process.

    - The teams will deliver the metaphor repository with a description and definition of the repository design, the semantic principles that were used and all results from the analysis of the linguistic and conceptual metaphors. Discussion of the outstanding issues, lessons and future directions will be included.

Eligibility Information

- Other Government Agencies, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), and any other similar type of organization that has a special relationship with the Government, that gives them access to privileged and/or proprietary information or access to Government equipment or real property, are not eligible to submit proposals under this BAA or participate as team members under proposals submitted by eligible entities.

- Non-US organizations and individuals may be able to participate.

  – Must comply with Non-Disclosure Agreements, Security Regulations, Export Control Laws, etc, as appropriate

  – Specific guidance for non-US participation will be provided in the BAA

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Proposal Guidance

- Your proposal should include a full discussion of the technical approach that will be used to meet all the program goals.

- Programmatic issues that should be addressed in the proposal:
  - Your team's current technical capabilities.
  - Key resources needed (not currently available to your team), to include capital equipment and special expertise (teaming will likely play an essential role in providing special expertise). The risk in acquiring these key resources, and mitigation strategies, should be indicated as well.
  - A teaming plan along with the roles, responsibilities and contributions of each member of the research team.
  - Data selection approach and justification.
  - Approaches to the automation of the metaphorical language analysis methodology.
  - Approaches to metaphor evaluation: valid social science methods, their relevance, their strengths and weaknesses, justification for their use.
  - End of phase and some intermediate milestones are set, but it is expected that other intermediate milestones that are on the critical path of the proposed approach will be offered.
  - A schedule of all milestones including a clearly charted description of the various risk mitigation strategies that will be undertaken to achieve program goals.

Teaming

- Because of the many challenges presented by this program, both depth and diversity will be beneficial for overcoming these challenges.

  - Throughput – Consider all that you will need to do, all the ideas you will need to test.
    - Make sure you have enough people and expertise to do the job.
    - Sufficient resources to follow critical path while still exploring alternatives; risk mitigation

  - Completeness – Teams should not lack any capability necessary for success, e.g., should not rely on enabling technology to be developed elsewhere.

  - Tightly knit teams
    - Clear, strong, management; single point of contact
    - No loose confederations
    - Each team member should be contributing significantly to the program goals. Explain why each member is important, i.e., if you didn't have them, what wouldn't get done?
    - No teaming for teaming's sake.

- Remember, you may be very accomplished, but can you do it all?

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Proposal Evaluation Criteria

- Overall Scientific and Technical Merit

- Effectiveness of Proposed Work Plan

- Relevance to the IARPA Mission and the Metaphor Program Goals

- Relevant Experience and Expertise

- Cost Realism

OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

LEADING INTELLIGENCE INTEGRATION

Additional Information

Dr. Heather McCallum-Bayliss

Program Manager

IARPA, Incisive Analysis Office

Office of the Director of National Intelligence
Intelligence Advanced Research Projects Activity
Washington, DC 20511

Phone: 301-851-7441

Fax: 301-851-7672

Electronic mail: dni-iarpa-baa-11-04@ugov.gov

(include IARPA-BAA-11-04 in the Subject Line)

Website: www.iarpa.gov