NEH Application Cover Sheet
Digital Humanities Start-up Grants

PROJECT DIRECTOR

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UNITED STATES

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Field of Expertise: Technical: Public Administration

INSTITUTION

Silverfields Institute
Stafford, VA UNITED STATES

APPLICATION INFORMATION

Title: *Knowledge Representation and Discovery in Philosophy*

Grant Period: From 5/2014 to 5/2015
Field of Project: Philosophy: Philosophy, General; Religion: Comparative Religion

Description of Project: This project will explore knowledge representation and discovery in philosophy. Principal activities of the project will explore the combination of data analysis, data mining, ontology development, argument modeling structures, data collection tools, and learning and visualization theories to facilitate efficient, accurate, and useful argument modeling. The results of the early planning stage will be a proof of concept, consisting of data mining and analytics process that delivers text segments in the target topic area, a prototype argument extraction tool to assist users in lifting arguments from the text segments, sample graphical representations of the extracted arguments, in formats designed to aid rapid understanding of the arguments, and a related ontology of the argument content. A long-term project plan will also be developed that includes large-scale production of representations, analysis of representations, and sharing representations in an interactive web environment.

BUDGET

Outright Request	$23,522.00	**Cost Sharing**	$2,000.00
Matching Request		**Total Budget**	$25,522.00
Total NEH	$23,522.00		

GRANT ADMINISTRATOR

Caroline Bloom
Director
201 Eaton Court
Stafford, VA 22554-3779
UNITED STATES

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List of Participants

Ms. Caroline Bloom, Silverfields Institute (Project Director)
Mr. Timothy Reaves, Silverfields Institute (Chief Technology Officer)
Mr. David Garrard (Data Mining and Analytics Expert)

Abstract

This project will explore knowledge representation and discovery in philosophy. Principal activities of the project will explore the combination of data analysis, data mining, ontology development, argument modeling structures, data collection tools, and learning and visualization theories to facilitate efficient, accurate, and useful argument modeling. The results of the early planning stage will be a proof of concept, consisting of data mining and analytics process that delivers text segments in the target topic area, a prototype argument extraction tool to assist users in lifting arguments from the text segments, sample graphical representations of the extracted arguments, in formats designed to aid rapid understanding of the arguments, and a related ontology of the argument content. A long-term project plan will also be developed that includes large-scale production of representations, analysis of representations, and sharing representations in an interactive web environment.

Statement of Innovation

This project is innovative in both methodology and outcome/product. The methodology combines data mining, analytics, and visualization tools with human analysis and interpretation. The products will be knowledge representations for understanding, learning, and discovery across the body of philosophical content. Representations are argument models showing the ideas that philosophical thinkers convey, along with relationships, contrasts, and conflicts among their ideas.

Statement of Humanities Significance

This project will make the vast content of philosophical knowledge available, in such a way that general audiences can more quickly understand concepts, issues, and context across a large body of works. It will provide academics in the field a resource for discovering new research topics. The project methodology can be expanded to other disciplines, such as comparative religion and sociology. Visualizations can be used in education programs or as a resource to assist with learning and research.

Project Narrative

This application is for a Level I grant.

Project start-up activities.

Start-up activities proposed for funding under this grant include the development of a proof-of concept, and refining the long-term project objectives, methodologies, and applications. Proof of concept development will include evaluation of available technologies (open-source and other) to determine the best candidates for the project; to identify modifications required to the technologies to fit them to the purpose of the project; and to identify how different technologies can best be combined to achieve the project results. Proof of concept will also include development of appropriate visualizations—graphical representations that best convey the meaning and allow users to quickly understand the content. Graphical modeling language will be adapted to render visualizations in an automated or semi-automated fashion, using an open source or commercial graphics application.

Enhancing the Humanities Through Innovation.

This project is innovative in two ways—methodology and product. The methodology will combine the use of available technologies with human analysis, interpretation, and knowledge management processes. The technologies, including data analysis, data mining, graphics rendering, and data collection applications will be modified as required and integrated to fit the project purposes.

The products will be knowledge representations (models and other visualizations) that (1) show the entities and relationships that philosophical thinkers convey—the objects in the world that the authors are describing or postulating. These representations will focus on the world or reality being described, and attempt to show how the thinkers observed and interpreted the world; (2) present multiple interpretations of the same texts; (3) show inconsistencies and contradictions or fallacies in the arguments; and (4) show relationships among or between the ideas, as well as contrasts or conflicts.

Research Questions.

1. How can the combination of data analysis, data mining, ontology development, argument modeling structures, and data collection tools best be used to facilitate efficient, accurate, and comprehensive argument modeling in a given topic area?
2. What kinds of visualization techniques are best for aiding understanding of the complexity and variation in philosophical content?
3. Using a "crowd sourcing" approach, how long will the methodology take to produce a meaningful quantity of representations?
4. Will presentation of philosophy using these representations make philosophy more easily and quickly understood by general audiences?
5. Will general audiences be more interested in philosophy if it is presented in this way?
6. Will modeling arguments and representing content of texts in a relational form uncover new concepts that were not readily apparent before?
7. Will significant inconsistencies in previous understanding, or gaps in areas of inquiry be found that were not noticed before?

4

Environmental Scan.

There are a couple of large ongoing projects that bear similarity to ours, and can be leveraged in this project through collaboration. The Indiana Philosophy Ontology Project (InPhO) is using data mining, expert feedback, and machine reasoning to create an ontology covering philosophical ideas, thinkers, and journals. The ontology is developed using four online sources of philosophical text: Stanford Encyclopedia of Philosophy, Internet Encyclopedia of Philosophy, PhilPapers, and HathiTrust/Google Books Collection. The ontology shows terms and schools of thought, and the relationships between them. The InPhO Project is similar to the envisioned first few steps of this project, but does not include the knowledge representation objectives of the project proposed in this application (https://inpho.cogs.indiana.edu).

CT2.0 is an archive of examples for Critical Thinking instruction that is developed and maintained by instructors of Critical Thinking. The project tracks student interest and classifies content to allow instructors to tailor examples to disciplinary interest, rather than just general ideas. (http://www.critthink2.org/about/). The content of this project focuses on critical thinking, and the archived instruction materials likely contain useful visualizations for application in learning/education programs. While the objectives of CT2.0 are limited to the informal logic, their methodology for disseminating or making content available to educators will be studied.

PhilPapers provides an index and bibliography of works in philosophy. PhilPapers includes books, journal articles, other articles by academic philosophers, and articles directly from PhilPapers users. Articles and papers are indexed by categories. There are 4643 categories managed by 413 volunteer editors in the PhilPapers Bibliography (structured bibliography of philosophy), which is accessible on their site (http://philpapers.org). PhilPapers is an excellent resource and potential collaborator for this project. PhilPapers indexes texts by philosophical topic and makes texts available for download, but does not produce knowledge representations.

History and Duration of the Project.

This project is in its early planning stages. Preliminary research has been conducted to explore methodologies for representing and comparing knowledge from a large body of philosophical texts in such a way that new knowledge could be uncovered and current knowledge could be more easily and quickly learned.

Silverfields Institute is actively seeking follow-on sustainment funding from multiple sources, and intends to continue the project if results of the proof-of concept are promising. Silverfields Institute intends to continue research in knowledge representation in the humanities. Representations will be made available to the public online and will also be used in the Institute's planned knowledge management and critical thinking education programs.

Work Plan.

All three participants will be involved in all parts of the work plan.
1. Preliminary planning activities:
    a. Refine high-level process concept (see Appendix 1), develop detailed business process model and finalize list of required technologies.
    b. Evaluate existing ontologies and taxonomies for use in the project.
    c. Select philosophical categories for proof of concept and identify required text metadata.
    d. Select initial core texts (more will be added during the project).
    e. Evaluate existing argument model notations and graphical argument representation metamodels for use in the project. Review available data mining, data analytics, and graphics rendering technologies and select those to be used in the proof of concept.

    f.   Plan and design the data store.

    g.   Establish collaborative relationships with experts in the field that can provide evaluative feedback on representation format and content and data collection tool.

2.   Develop the data store and computing environment. The project proof of concept will use cloud computing, application hosting, and data storage services to reduce cost of computer hardware and overhead. During this step, selected technologies will be installed and tested, and source documents will be added to the data store with appropriate metadata (i.e., author, dates and locations written/published, influence relationships to other authors).

3.   Refine high-level ontology for proof-of-concept, using initial core texts. The ontology will draw on existing ontologies, but for the objective representations, the ontology must be scoped and tailored to that purpose. It will contain the entities, activities, and relationships represented in the texts, in addition to the names of theories, schools of thought, and philosophers. Sample project ontology is contained in appendix 2.

4.   Apply text analytics tools. This step will begin and continue concurrently with the ontology development step; analytics tools will return text segments relative to search criteria (based on ontology) and patterns in the texts that will be used to support continued ontology development and follow-on searches for text segments.

5.   Develop knowledge representation format. During this step, a small number of related representations will be created based on discrete versions of reality represented in selected texts (using text segments retrieved in step 4). Arguments will be extracted (using human analysis) and modeled in a graphical form, using the activities, states, entities, and other components of the ontology. Representations will be provided to discipline experts for evaluation.

6.   Develop prototype data collection tool for argument extraction. The argument extraction step requires human analysis. Future development may increase the automation of argument extraction, but the proof-of-concept is based on "crowd sourcing" (targeting students and qualified experts in the field) to extract arguments. A prototype application will be developed so that users can quickly extract and render arguments. Feedback on the prototype will be collected from users.

Staff.
Ms. Caroline Bloom is the project director. She will manage the work plan, establish required collaboration relationships, and handle other project communications and administrative needs. She will also participate in most work plan steps. She will contribute 30 or more hours per month. Mr. Timothy Reaves is the technology officer responsible for technology selection and implementation of the data store and data collection tool development. He will contribute 20 or more hours per month. Mr. David Garrard will provide assistance with ontology development and data mining activities. He will contribute 12 or more hours per month.

Final product and dissemination.
A report will be written that describes in detail the results of each step in the work plan. The report will include copies of the representations created along with citations referencing the text sections they were extracted from. The report will also include screen-shots of the data collection/argument extraction tool user interface. Comments and feedback collected will be summarized in the report. The report will provide lessons-learned and a long-term project way ahead, which will include larger scale production of representations, analysis of representations, and sharing representations in an interactive web environment.

Budget Form

NATIONAL ENDOWMENT FOR THE
Humanities

Applicant Institution: *Silverfields Institute*
Project Director: *Ms. Caroline Bloom*
Project Grant Period: *05/10/2014 through 05/09/2015*

click for Budget Instructions

	Computational Details/Notes	(notes)	Year 1 05/10/2014-05/09/2015	(notes)	Year 2 01/01/20__-12/31/20__	(notes)	Year 3 01/01/20__-12/31/20__	Project Total
1. Salaries & Wages								
		%		%		%		$0
		%		%		%		$0
2. Fringe Benefits								
								$0
3. Consultant Fees								
								$0
4. Travel								
	Bloom OR Reaves travel between OH/VA (10x during 1 year); airfare ($450); rental car ($160); M&I ($51x3days) x 10 trips.		$7,630					$7,630
	Participants travel for collaboration meetings (2 three-day trips). Airfare $1400, rental car $160, per diem (hotel, M&I) $792		$4,704					$4,704
5. Supplies & Materials								
	general office supplies (printer cartridges, paper, whiteboards, markers, etc.)		$500					$500
6. Services								
Computing and web hosting services.	$87.60 per month x12		$1,051					$1,051
7. Other Costs								
Participant Stipend	$200 per month (Garrard)		$2,400					$2,400
Participant Stipend	$400 per month (Reaves)		$4,800					
Laptop computer	Macbook Pro		$2,799					$2,799
Large computer display	Apple Display		$999					$999
Portable projector	Epson - PowerLite 1751 XGA 3LCD Multimedia Projector		$650					$650

Budget Form

NATIONAL ENDOWMENT FOR THE Humanities

Applicant Institution: *Silverfields Institute*
Project Director: *Ms. Caroline Bloom*
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click for Budget Instructions

	Computational Details/Notes	(notes)	Year 1	(notes)	Year 2	(notes)	Year 3	Project Total
8. Total Direct Costs	Per Year		$25,533		$0		$0	$25,533
9. Total Indirect Costs								
	Per Year		$0		$0		$0	$0
10. Total Project Costs				(Direct and Indirect costs for entire project)				$25,533

11. Project Funding	**a. Requested from NEH** Outright:	$23,522
	Federal Matching Funds:	$0
	TOTAL REQUESTED FROM NEH:	**$23,522**
	b. Cost Sharing Applicant's Contributions:	$2,000
	Third-Party Contributions:	$0
	Project Income:	$0
	Other Federal Agencies:	$0
	TOTAL COST SHARING:	**$2,000**
12. Total Project Funding		**$25,522**

Total Project Costs must be equal to Total Project Funding ----> ($25,533 = $25,522 ?)

Third-Party Contributions must be
greater than or equal to Requested Federal Matching Funds ----> ($0 ≥ $0 ?)

The budget includes a laptop computer and display for project director use; travel funds for the participants to meet periodically for three-day work sessions (participants live in Virginia and Ohio); travel funds for participants to travel and meet with collaborators/experts in the philosophy discipline; a portable projector for use during work sessions; data storage and cloud computing services; and small stipends for the participants (other than the project director).

Participant Biographies

Ms. Caroline Bloom has an undergraduate degree in biology with a minor in philosophy, and a master's degree in public administration with a minor in knowledge management. Ms. Bloom is a co-founder of Silverfields Institute. Ms. Bloom served in the United States Marine Corps (USMC) as an intelligence officer and is currently serving part-time as a reserve information operations planner. She is a Department of Defense civilian employee, and serves as the Deputy Chief Management Officer. She is currently overseeing design and implementation of a knowledge management and decision support program for USMC force development.

Mr. Timothy Reaves is a co-founder of Silverfields Institute. He is an accomplished professional with an extensive, broad-based computer background. He has experience in enterprise architecture, application architecture, systems engineering, database design and data management, software development, and project management. He has recent experience in creating architectures capable of supporting enterprise-class applications, in the data mining and data analysis areas, with emphasis on knowledge extraction, and workflows to facilitate human processing of automated analysis responses.

Mr. David Garrard is a systems engineer and functional analyst in the Department of Defense. He has 35 years of experience focused on command, control, communications, computers, networks, and sensors in aviation, intelligence, and space systems domains. His hands-on experience generated expertise in system architecting, system engineering, and knowledge and information sciences. He used his broad base of experience and in-depth knowledge to create an "integrated information infrastructure", a system that enabled advanced data analysis of cross-discipline, multi-domain structured and unstructured data and provided decision support to systems engineers, program managers, and other acquisition decision-makers. Mr. Garrard served as an air defense officer and acquisition project manager in the USMC. He has an undergraduate degree in Business Administration and Management, and a master's degree in Contracting and Acquisition Management.

Data management plan

Data generated by the research.
This project proof of concept will generate the following data:

1. Sample argument representations, each with associated citation data and argument model notation.

2. Ontology database containing structured content derived from texts and argument models.

3. Reports and whitepapers regarding visualization methods, argument modeling notations, and argument modeling methodologies.

4. Prototype data collection software for argument extraction.

Plan for managing the data.

These items will be retained under configuration management processes in the Institute's persistent data store (cloud computing/data store service initiated in this start-up project). Should the Institute be unable to continue the project, data will be retained until it can be transferred to an appropriate third party steward.

Items 1-3 will be made available for viewing via our website at the end of the start-up performance period. A decision about when to make prototype software freely available must be determined later during the project evaluation stage and when the long-term project plan is finalized.

9109 River Corners Road
Homerville, OH 44235

September 11, 2013

Ms. Caroline Bloom
Silverfields Institute
13053 Elk Run Road
Bealeton, VA 22712

Ms. Bloom:

This letter is to confirm my support and commitment for the Knowledge Representation and Discovery project. Should the project be funded through the National Endowment for the Humanities Digital Humanities Start-Up Grants program, I agree to commit my services and expertise in database design, data analysis, data mining, software application design and development, project management, and web development, during the 1-year period of performance in order to generate a long-term project plan and proof-of-concept. I agree to dedicate approximately 20 hours per month to the project.

Sincerely,

Timothy E. Reaves

Stafford, VA 22554

September 11, 2013

Ms. Caroline Bloom
Silverfields Institute
13053 Elk Run Road
Bealeton, VA 22712

Ms. Bloom:

This letter is to confirm my support and commitment for the Knowledge Representation and Discovery project. Should the project be funded through the National Endowment for the Humanities Digital Humanities Start-Up Grants program, I agree to commit my services and expertise in ontology development, data modeling, data management, and decision-support tools and applications during the 1-year period of performance which will generate a long-term project plan and proof-of-concept. I agree to dedicate approximately 12 hours per month to the project.

Sincerely,

David L. Garrard

Target content, such as that related to the topic area being modeled.

An argument modeling tool will assist users in extracting arguments from the texts.

Search Criteria

Texts

Ontology Data

Develop Ontology

Search, Analyze, and "Mine" Data

Extract Arguments

Render Argument Visualizations

Analyze and Synthesize Arguments

Patterns

Arguments

Visualizations

Text Segments

The argument modeling tool will translate arguments to a format suitable for graphical rendering.

LEGEND

Data Object

Process Activity

Start

End

Sequence Arrow

Information Flow
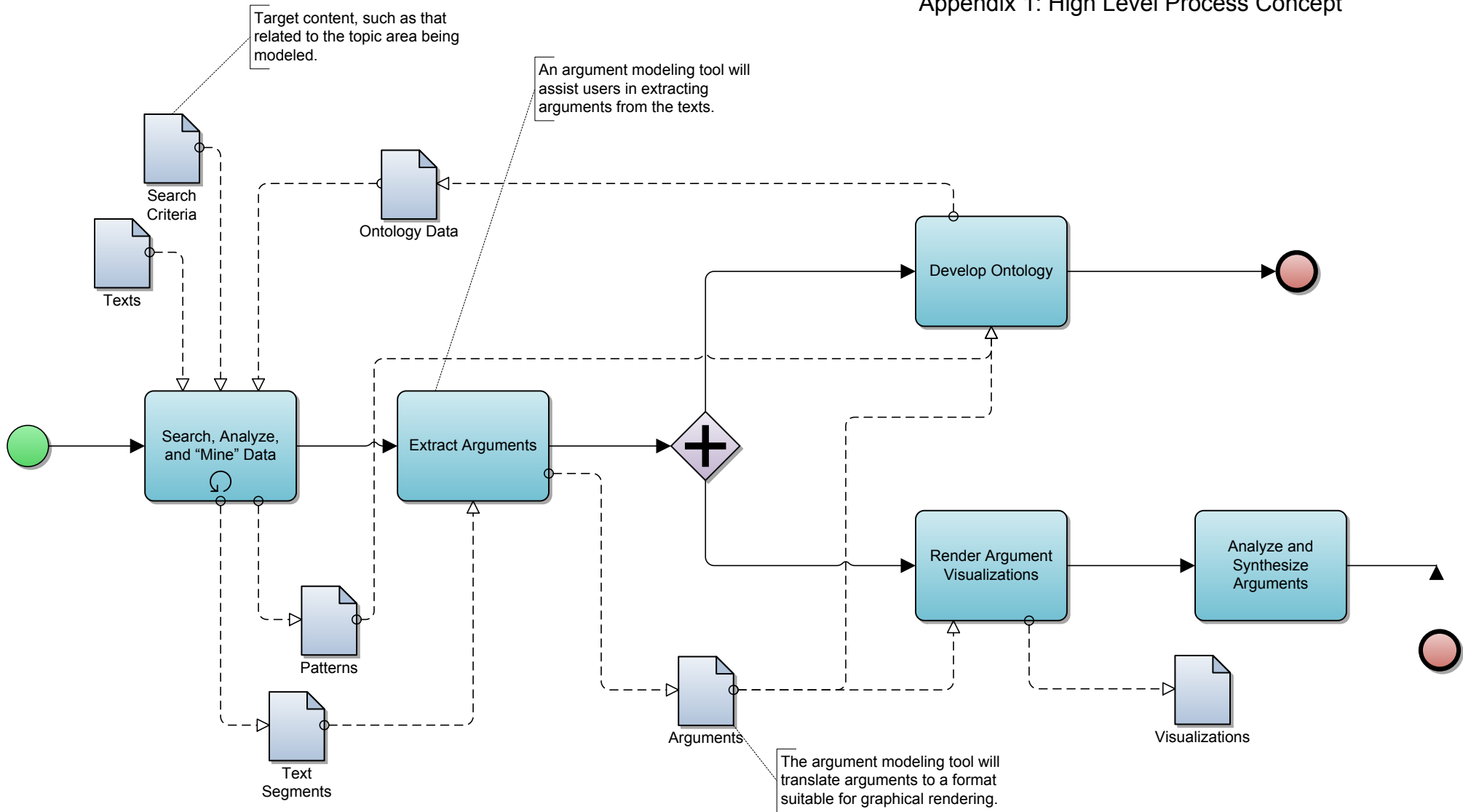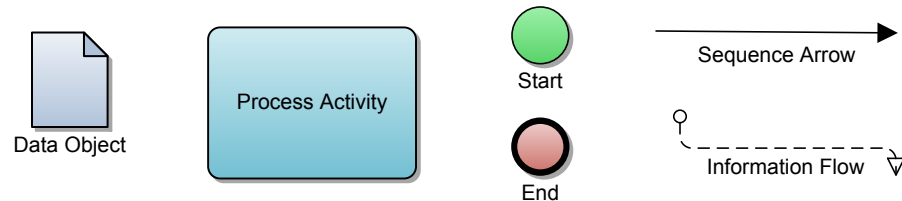
Appendix 2: Sample Project Ontology

This sample contains draft high-level categories, and is provided for illustration purposes only.

Category Name	Definition	Example Members
Entities	Proposed, assumed, postulated, hypothetical, and real objects or things with distinct existence. Includes subcategories for concrete and abstract objects.	Humans Deities Plants Goodness Natural laws Emotions Centaurs
Activities	Actions performed by (or passively caused by) entities	Thinking Causing Inhabiting Governing
States	Conditions and qualities of entities, which can be changed by activities.	Unaware Aware Good Evil Wise
Systems	Metaphysical or ethical schools of thought that have been given names in the literature.	Natural Law Tradition Utilitarianism Moral Universalism

Concept, Idea, or Argument

Other Words/Phrases Used as Synonyms for Thing

Component-1
Component-2
Component-3

Thing or Class of Things

Attribute-1
Attribute-2
Attribute-n
InconsistentAttribute-n

Member of Class of Things

Other Words/Phrases Used as Synonyms for Thing

Relationship Relationship Definitions

Relationship Relationship Definitions

Postulated or Proposed Object

Attribute-1

Conflicting Element of Argument

This sample is provided for illustrative purposes only, and was developed using arguments from the below cited text. This argument is related to earlier arguments by Thomas Aquinas, and was chosen to explore representation formats because of its simple and straightforward language, and its popularity among general audiences as a "good" argument. Lewis, C.S. (1943). The law of human nature. In *Mere Christianity*. Retrieved from http://lib.ru/LEWISCL/mere_engl.txt

Other Laws of Nature

Instincts

Law of Nature
Law about Right and Wrong
Rule about Right and Wrong
Rule of fair play
Rule of decent behavior
Morality
Not putting self first
"Curious idea that they ought to behave in a certain way"

Law of Human Nature

Governs

Governs

- Governs as gravitation governs bodies

"Odd individual here and there who did not know it, just as you find a few people who are colour-blind or have no ear for a tune" (p. 5).

- Know and recognize it.
- Agree with it.
- Do not have to be taught it.
- May disobey.
- Feel guilty if they disobey.
- Expect other humans to act in accordance with it.

Some Humans

Humans

Not governed by Law of Human Nature

Human Beings
Man

Most Humans

May disobey the Law of Human Nature "if he chooses" (p. 5).

Humans feel guilty if they disobey (they make excuses and "cannot bear to face the fact").

Humans that recognize or know Law of Human Nature