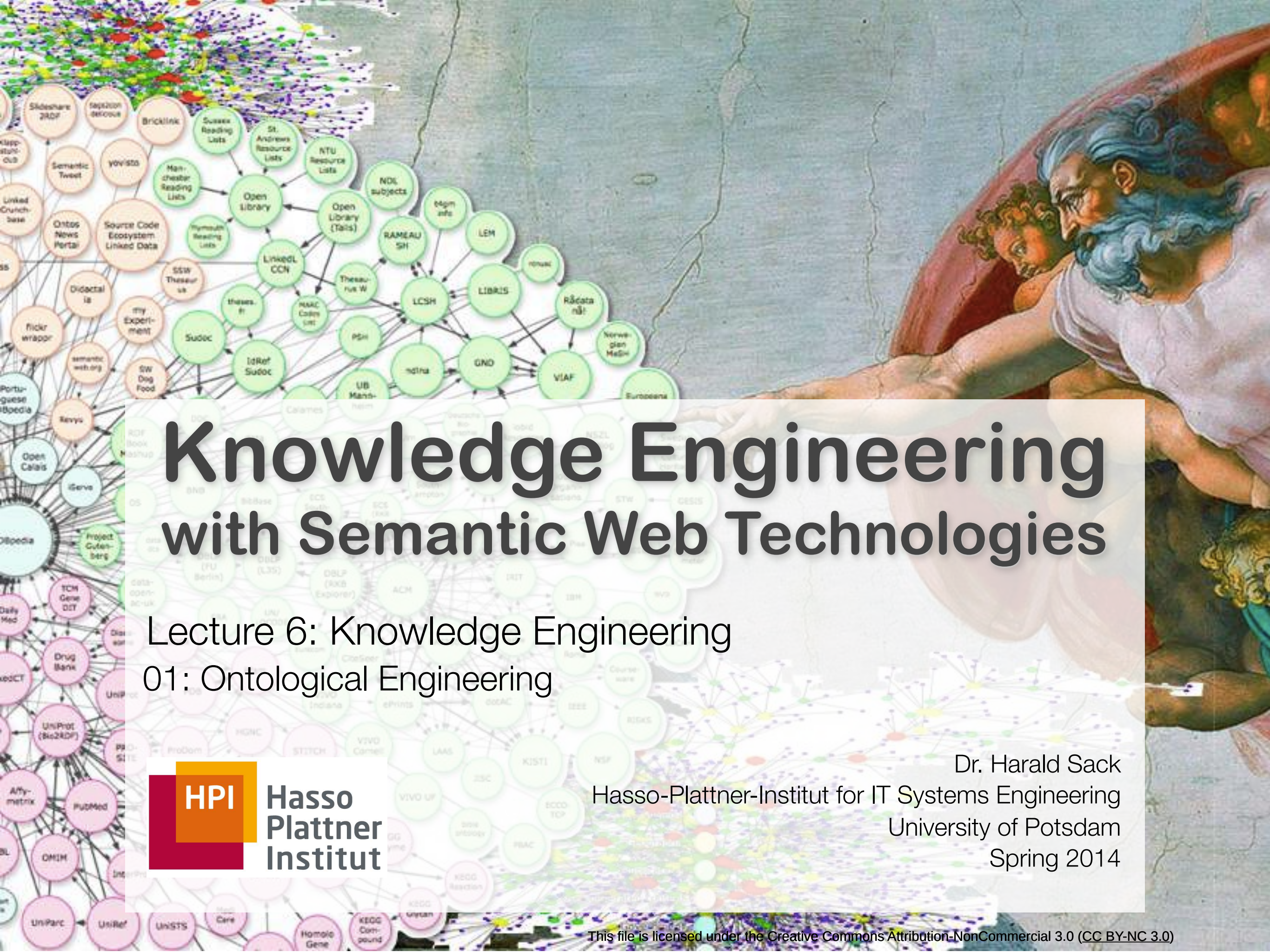




Knowledge Engineering with Semantic Web Technologies

Lecture 6: Knowledge Engineering 01: Ontological Engineering

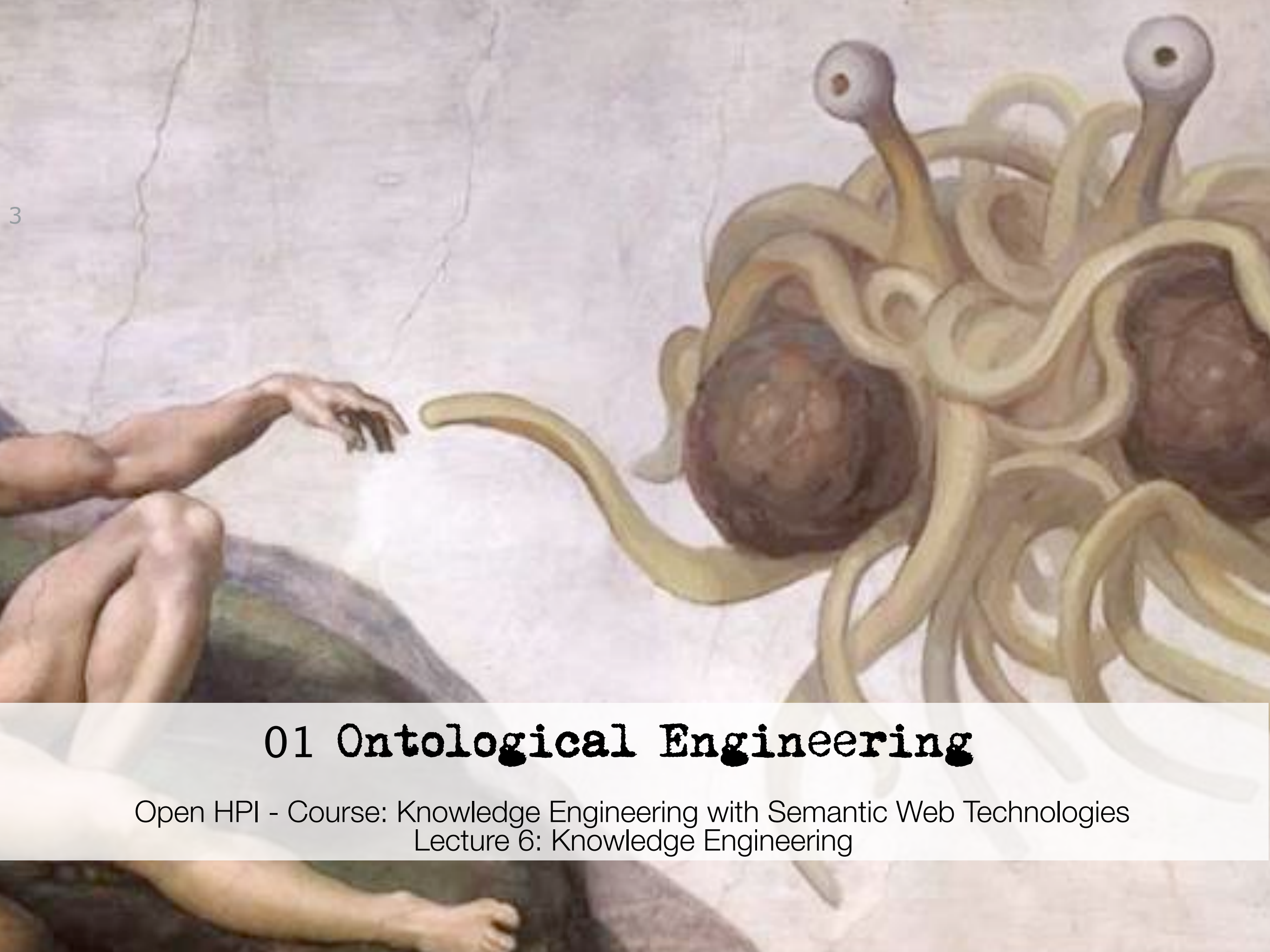


Dr. Harald Sack
Hasso-Plattner-Institut for IT Systems Engineering
University of Potsdam
Spring 2014



Lecture 6: Knowledge Engineering

Open HPI Course: Knowledge Engineering with Semantic Web Technologies



01 Ontological Engineering

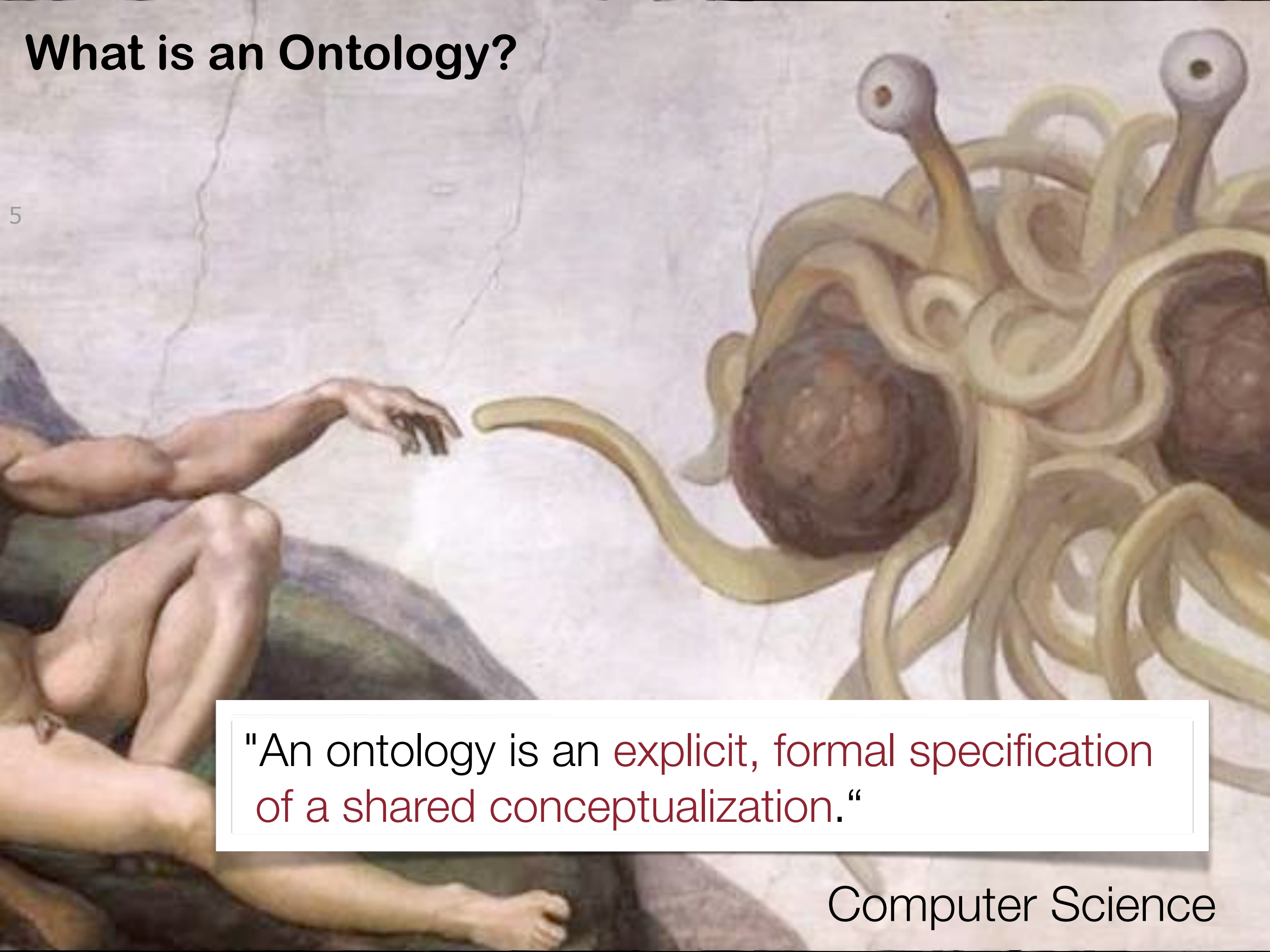
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Lecture 6: Knowledge Engineering

What is an Ontology?

„A theory of being, which tries to explain the being itself, by developing a system of universal categories and their intrinsic relationships...”

Philosophy

What is an Ontology?

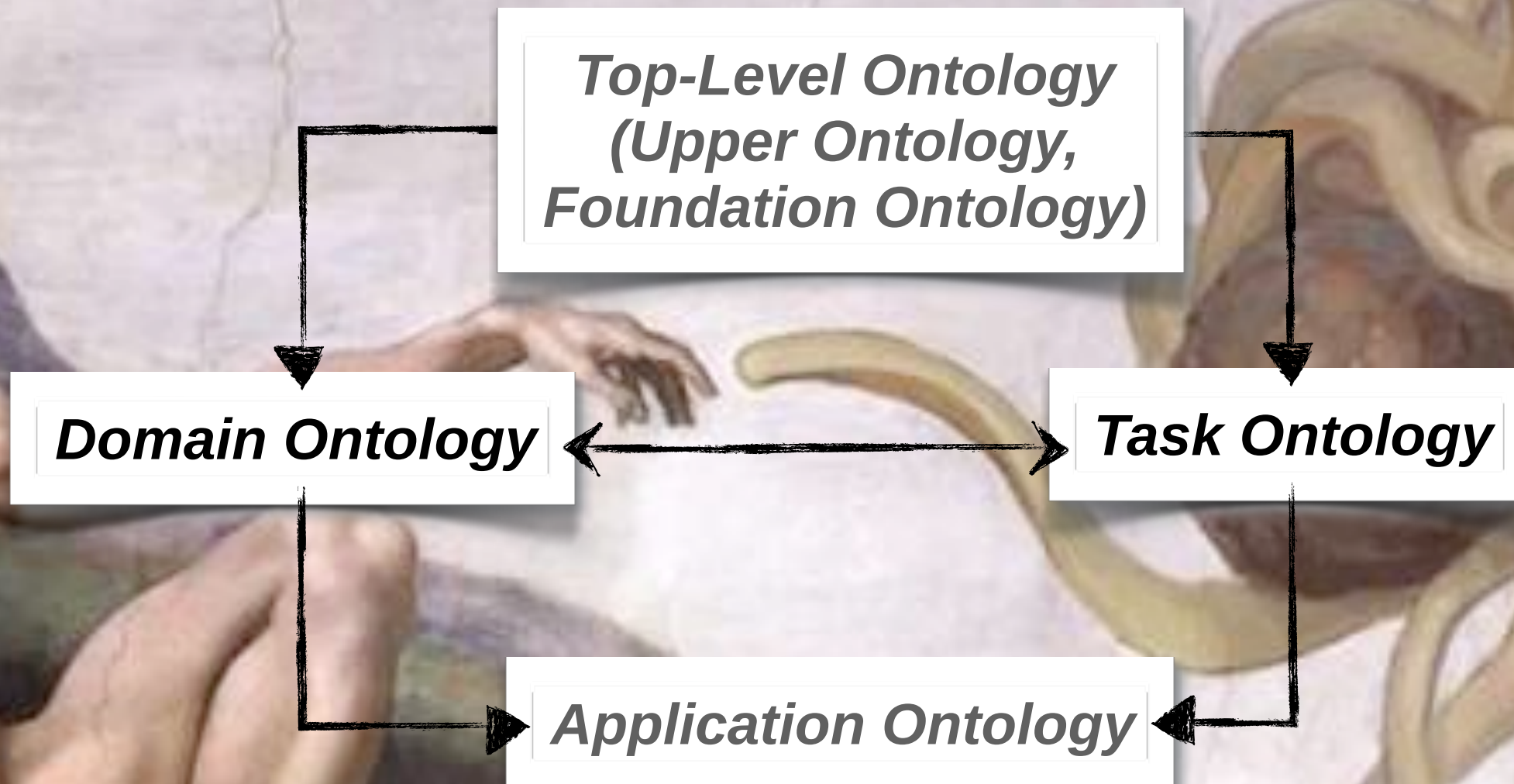


"An ontology is an explicit, formal specification of a shared conceptualization."

Computer Science

What is an Ontology?

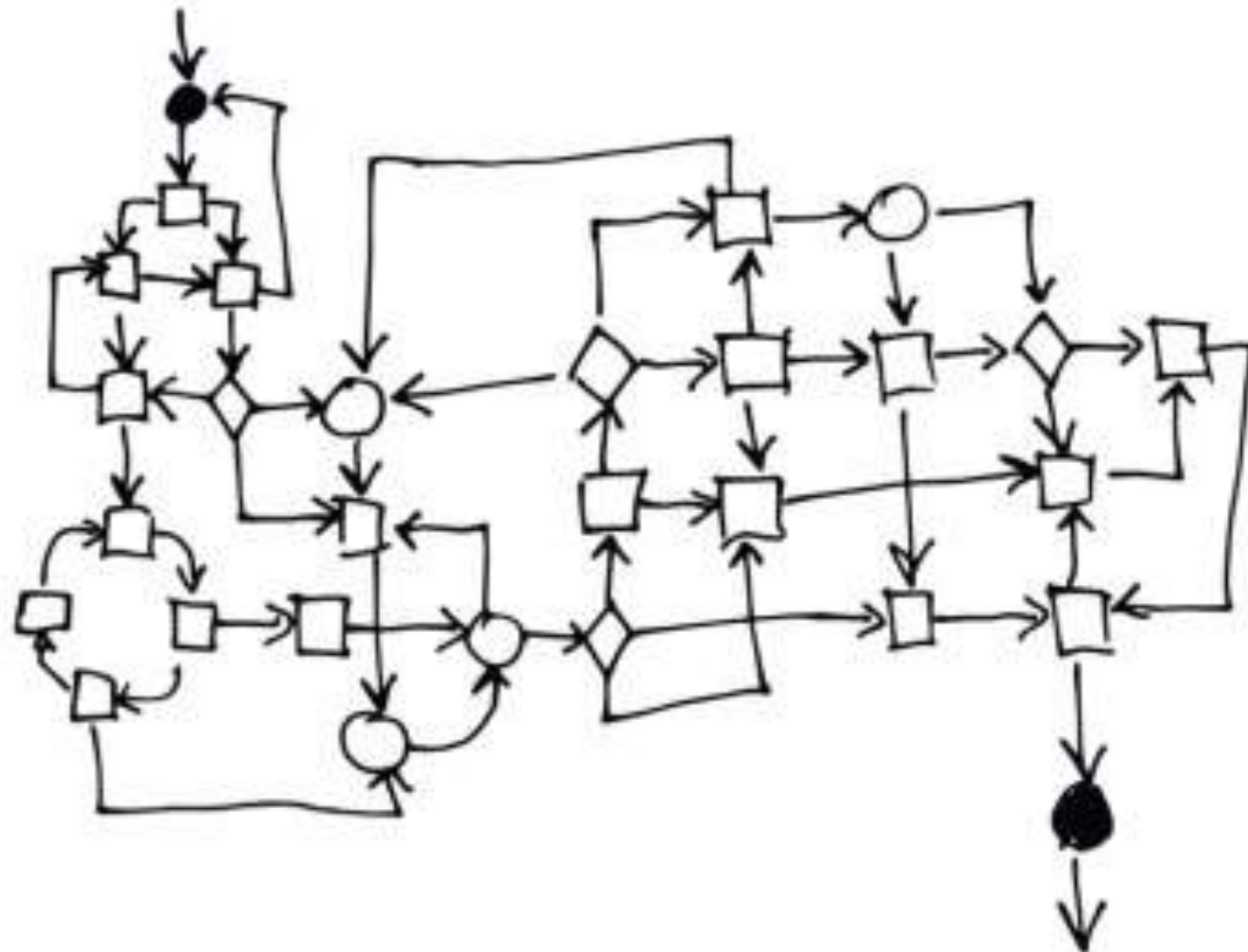
6



- Ontologies enable **interoperability** among metadata
- Therefore, we need
 - Methods for efficient development of ontologies (**Ontology Design**)
 - Methods for efficient comparison of ontologies (**Ontology Mapping**)
 - Methods for efficient combination of ontologies (**Ontology Merging**)
- There are automated methods to support Ontological Engineering:
 - Learning new ontologies from a given set of information resources (**Ontology Learning**)
 - Populating existing ontologies with individuals from information resources

ONTOLOGY DEVELOPMENT PROCESS

SOMETHING



GREAT
ONTOLOGY



geek & poke

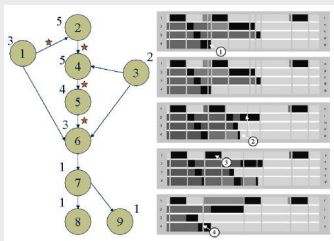
9

- *A methodology of Ontology Design describes all activities necessary for the construction of an ontology.*

- Why do we need a formal methodology?
 - development of **consistent** ontologies
 - **efficient** development of complex ontologies
 - **distributed** development of ontologies
- We distinguish (acc. to Fernandez-Lopez et. al., 1997)
 - Ontology management activities
 - Ontology development oriented activities
 - Ontology support activities

Ontological Engineering

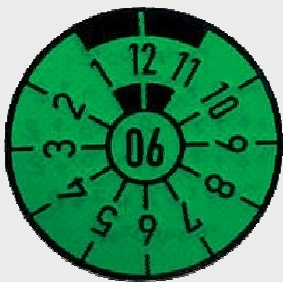
Management



scheduling



control



quality assurance

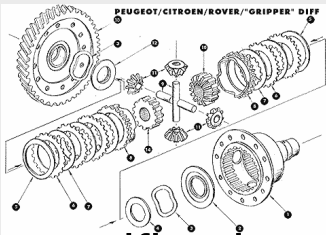
Development Oriented



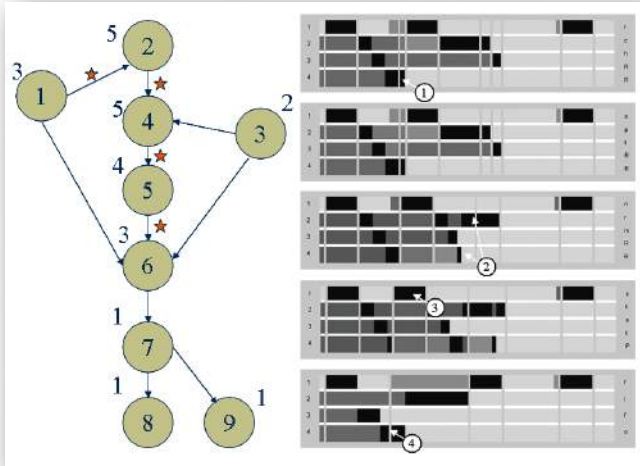
environment study



feasibility study



Ontology Management Activities



● Scheduling

- Identification of tasks/problems to solve
- Arrangement/planning of tasks/problems to solve
- Identification of required resources (time, memory, etc...)



● Control

- Guaranteeing correct execution of tasks/problems to solve



● Quality Assurance

- Quality assurance of all produced resources during development (ontologies, software, documentation)

- 12
1. Pre-Development
 2. Development
 3. Post-Development

1. Pre-Development

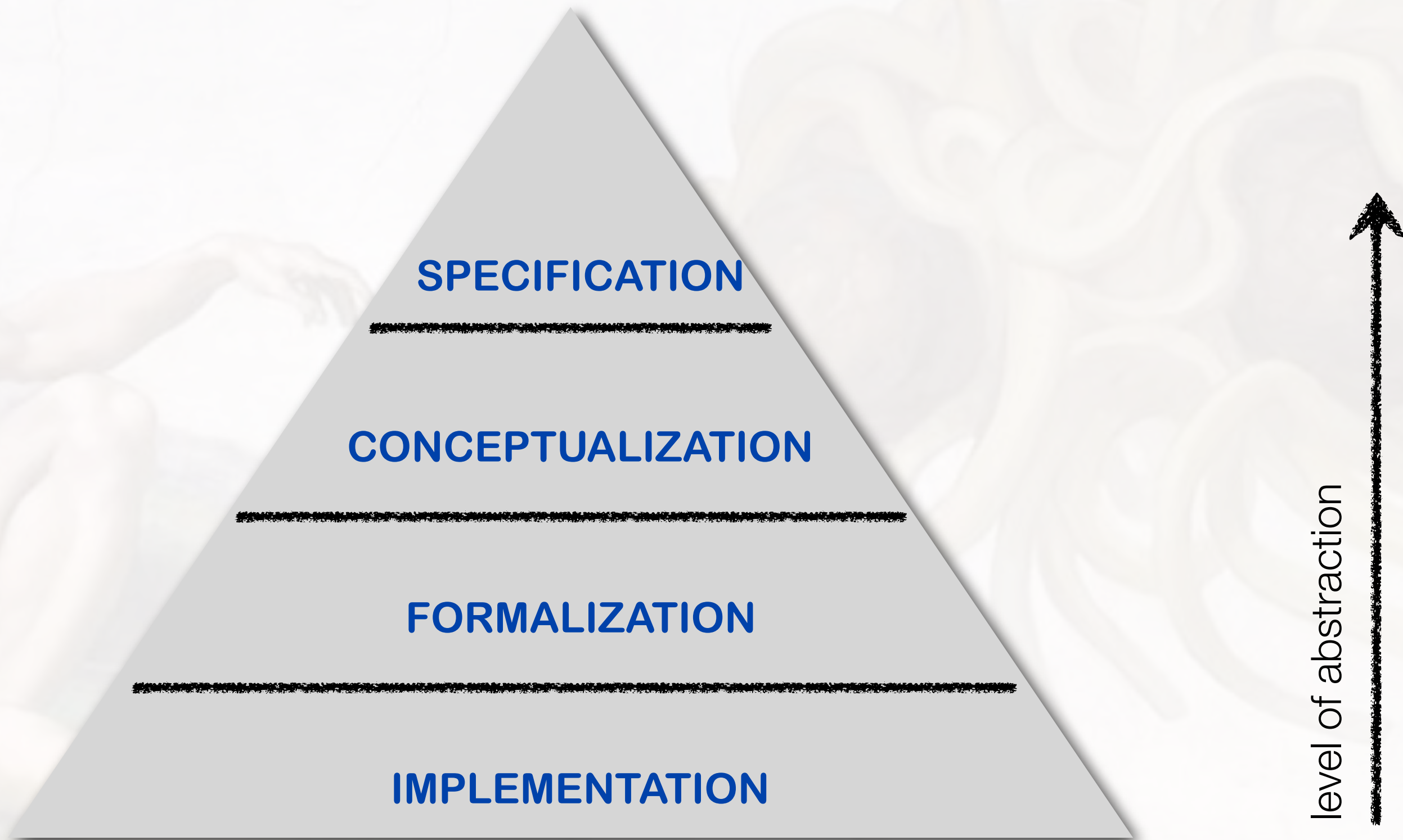
● Environment Study

- What is the designated software platform for the ontology?
- Which applications should use the ontology?

● Feasibility Study

- Can the ontology really be developed?
- Does it make sense to develop the ontology?





2. Development

● Specification

- Why is the ontology developed, what is the benefit and who are the end-users?

● Conceptualization

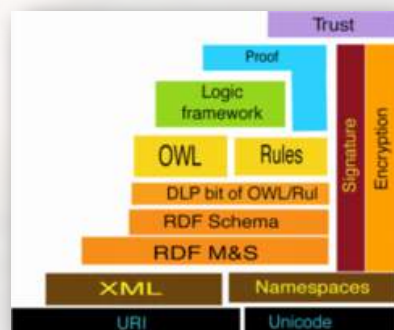
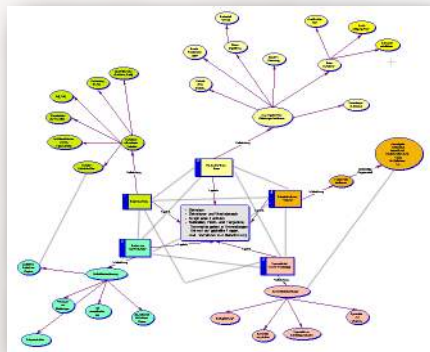
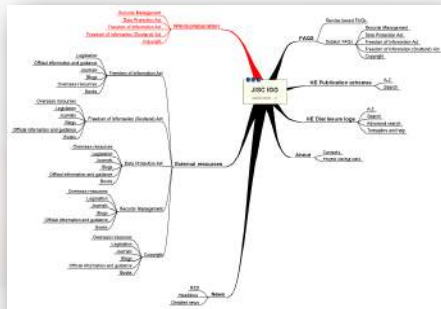
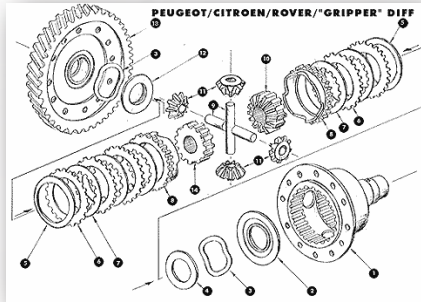
- Structuring domain knowledge in a conceptual model

● Formalization

- Formalize conceptual model in (semi-)computable model

● Implementation

- Construction of a computable model in an ontology representation language





3. Post-Development

- **Maintenance**

- Update and adjustment of the ontology (if necessary)

- **Use / Reuse**

- Usage of the ontology within the designated applications as well as in unplanned applications/ontologies



Ontology Support Activities

16



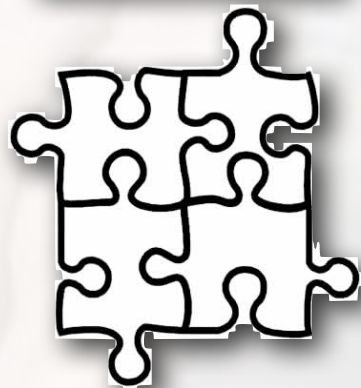
- **Knowledge Acquisition**

- Gather knowledge from experts (Ontology Learning)



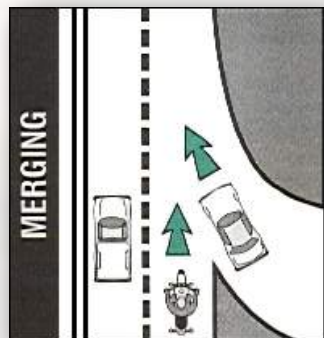
- **Evaluation**

- Technical evaluation of the ontology in each step of the development process



- **Integration**

- Reuse of existing ontologies (Ontology Reuse)



- **Merging**

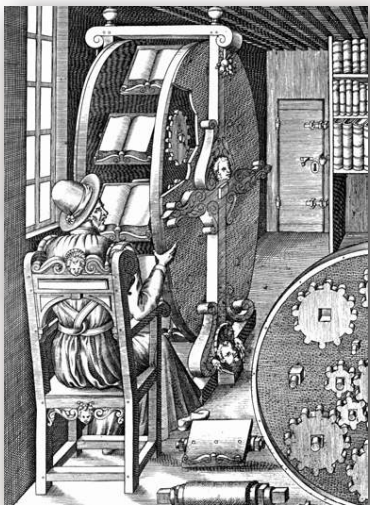
- Construction of a new ontology from already existing ontologies within a specific domain

Ontology Support Activities



- **Alignment**

- Design/apply mapping rules for involved ontologies



- **Documentation**

- Each step of the ontology development must be accurately documented

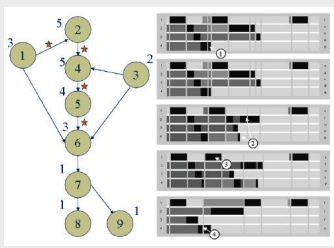


- **Configuration Management**

- Manages all versions of documentation and of the developed ontology

Ontological Engineering

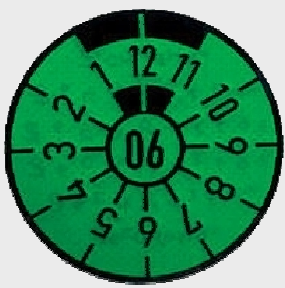
Management



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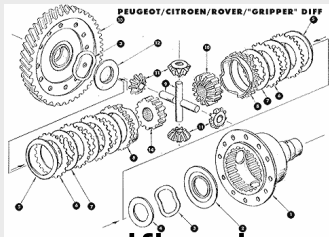
Development Oriented

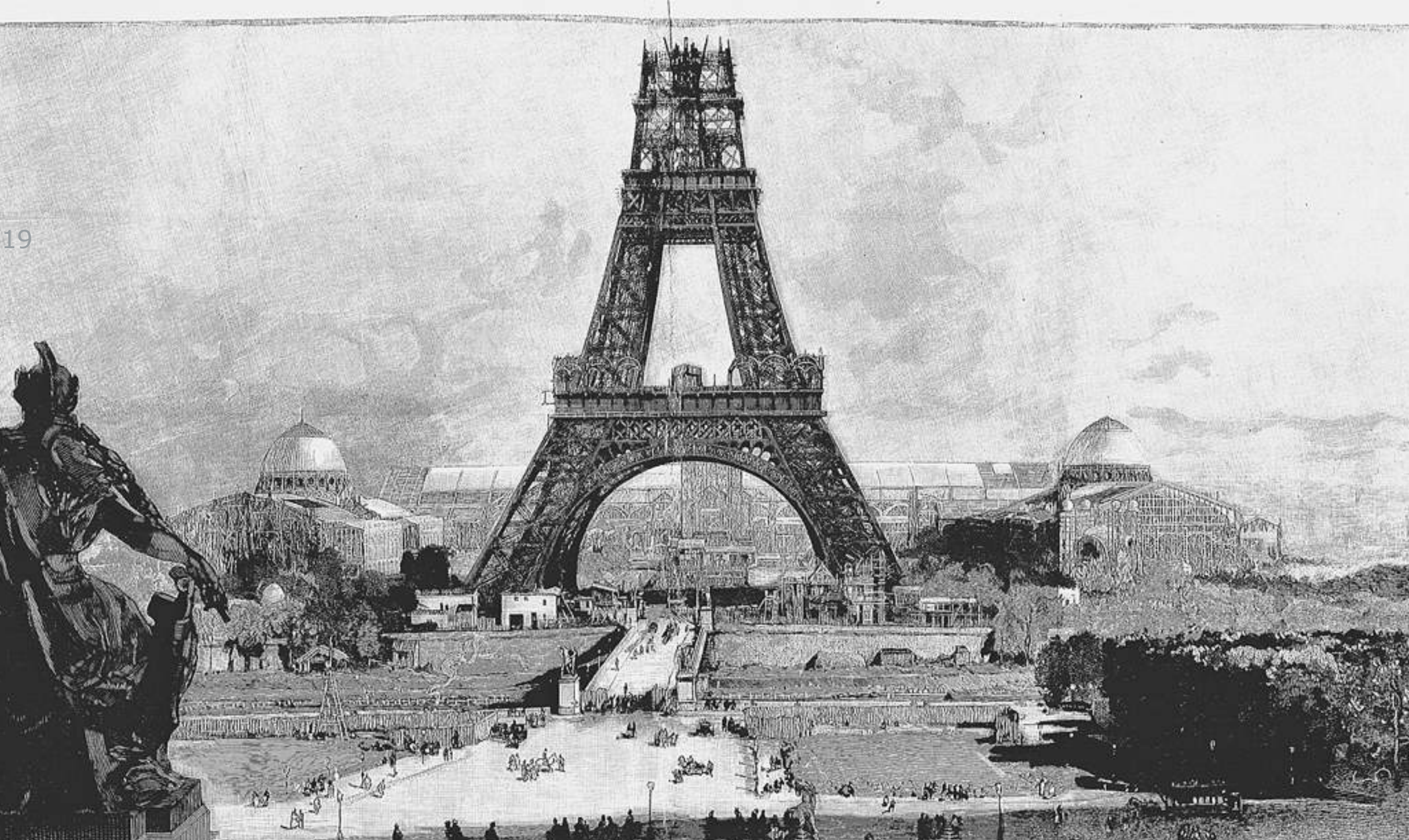


environment study



feasibility study





02 - Ontology Design Methodologies

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Lecture 6: Knowledge Engineering