

# SODA: A Roadmap to Artefacts



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## Outline

- Agents & Artefacts
- SODA+artefacts
- Zooming Artefacts
- Conclusions and Future Work

# Introduction

- Agents never live alone
  - they coexist with other agents in a MAS
  - within an *environment* where they act and interact
- The agent abstraction alone is not enough to fully model the environment
- The environment entities are not agents



ARTEFACTS

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# Artefacts

- Artefacts take the form of objects or tools that agents *share* and *use* to
  - support their activities
  - achieve their objectives
- Artefacts are explicitly designed to provide some *functions* which guide their use.
- An artefact can have *responsibilities*

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# Example

- Coordination Artefacts
  - govern social activities
  - enable and mediate agent interaction
  - mediate the interaction between individual agents and their environment
  - capture, express and embody the parts of the environment that support agents' activities

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# Features & Classification

- An artefact exposes:
  - usage interface
  - operating instructions
  - function description
- Other interesting artefact features are:
  - inspectability
  - malleability
  - linkability
- A possible classification
  - individual artefacts
  - social artefacts
  - resource artefacts

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# Agents & Artefacts

- Artefacts constitute the basic building block both for
  - MAS analysis/modelling
  - MAS development
- Agents and Artefacts can be assumed as two fundamental abstractions for modelling MAS structure
  - agents speaking with other agents
  - agents using artefacts to achieve their objectives

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# Meta-model Ingredients

- Agents & Artefacts lead to new *ontological meta-model* for MASs
- Artefacts allow to
  - model the environment as a first-class entity
  - engineer the space of interaction among agents (not only mere conversations between agents, but complex agent interaction patterns)
  - enrich MAS design with social/organisational structure, topological models, as well as (complex) security models

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## In particular...

- Agents model individual/social activities
- Artefacts **glue** agents together
  - they mediate between individual agents and MAS
  - they build up agent societies
  - they wrap up and bring to the cognitive level of agents the resources of MAS

Individual  
Artefacts

Social  
Artefacts

Resource  
Artefacts

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## Meta-model in AOSE

- AOSE methodologies should then enable and promote the design of artefacts
- However, no known agent-oriented methodology adopts agents and artefacts as its basic abstractions
- As a consequence, we choose to extend an existing agent-oriented methodology (SODA) with the notion of artefact

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# Artefact-ed SODA

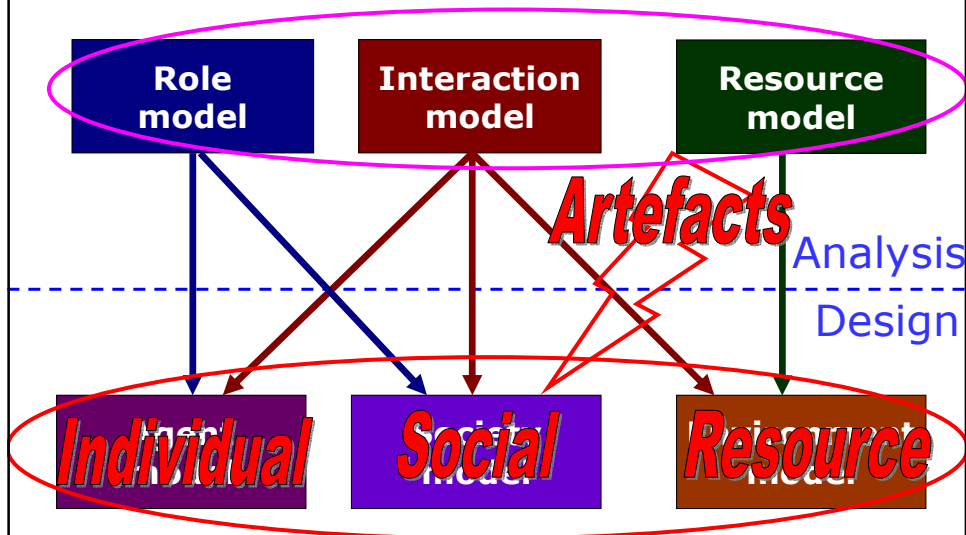
- SODA concentrates on *inter-agent* issues, like the engineering of societies and infrastructure
- The SODA *analysis* phase is based on three models:
  - the *role model*
  - the *resource model*
  - the *interaction model*
- The SODA design phase is also based on three models:
  - the *agent model*
  - the *society model*
  - the *environment model*

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## Model Relation



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# Zooming Artefacts

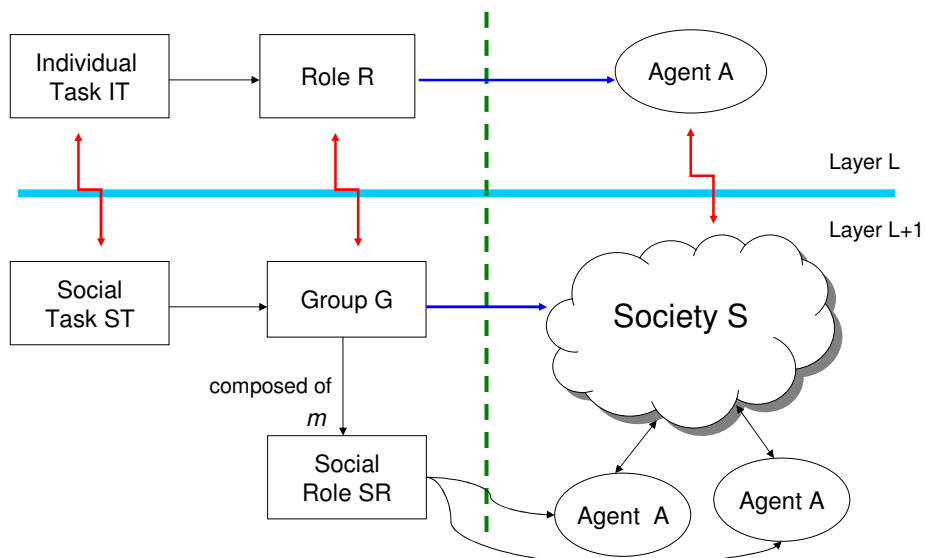
- Artefacts have a relevant impact on any AOSE methodology
- The notion of artefact itself is affected by the principles of the methodology where it is introduced.
- This is evident when the *zooming principle* is applied to artefacts.

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# Zooming in SODA

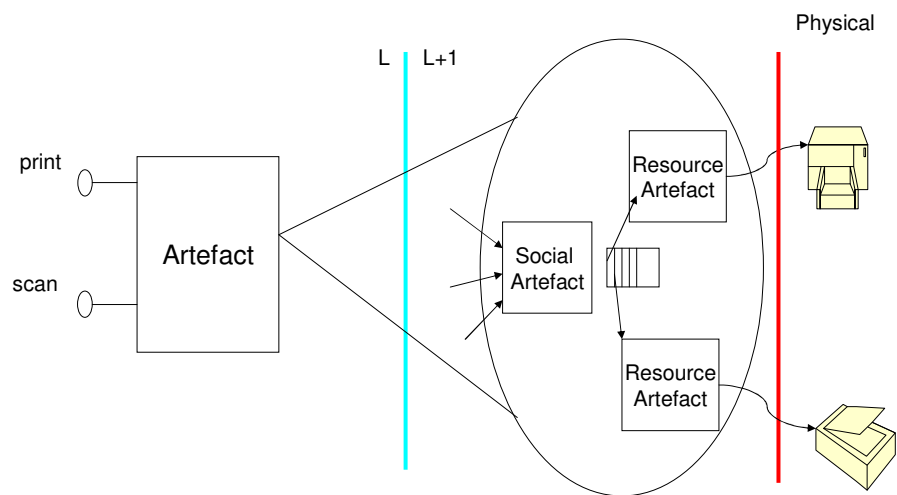


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# Zooming Artefacts: an Example



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## Artefact Benefits

- Social artefacts embody / extend coordination media facilities
  - provide for the required *quality of coordination*
  - act as a kind of “social memory”
  - allow us to introduce the organisational model in a natural way
- Resource artefacts better represent the MAS environment
  - they raise resources up to the agent cognitive level
  - they highlight the need of a topological model
- Individual artefacts associate interaction protocols to agents
  - promotes the introduction of RBAC model

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## Conclusions

- We are investigating the impact of assuming a new ontological meta-model in AOSE – Agents & Artefacts
- We extended SODA with the concept of artefact
  - artefacts fit well with SODA models
  - the zooming principle has an impact on artefacts, too

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## Future Work

- Understanding the implications of the artefacted meta-model in terms of the fundamental agent-oriented abstractions
- Developing suitable design tools for modelling systems with SODA
- Forthcoming in SODA:
  - the *topological model*
  - the *organisational model*

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## Zoom in SODA

- Goal: scaling with the complexity of task description by introducing a simple layering principle into the models of the analysis phase (role, resources, interaction models).
- Each layer contains a description of the models at a given abstraction level
- The models of the design phase become layered indirectly, since they map the layers described in the analysis phase

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