A Model of Almost Everything: Norms, Structure and Ontologies in Agent Organizations

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The OMNI Framework

OMNI (Organizational Model for Normative Institutions) is an integrated framework for modelling a whole range of MAS, from **closed systems** with fixed participants and interaction protocols, to **open**, **flexible systems** that allow and adapt to the participation of heterogeneous agents with different agendas.

three levels of abstraction

three dimensions
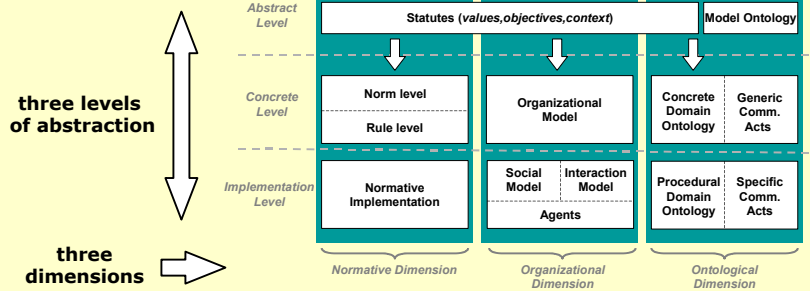
Abstract Level

The **Abstract Level** defines

• the statutes of the organization,
• the generic terms,
• the model ontology

The **statutes** indicate

• the **main objective** of the organization,

• the **values** that direct the fulfilling of this objective,

• the **context** where the organization performs its activities.

The **generic terms**

The definition of terms that are generic for any organization (that is, that are incontextual)

The **model ontology**

A meta-ontology that defines all the concepts of the framework itself, such as norms, rules, roles, groups, violations, sanctions and landmarks.
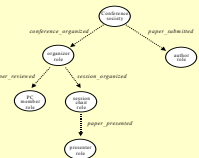
Concrete Level

The **Concrete Level** specifies the analysis and design process, starting from the abstract values and objectives defined in the previous level, refining their meaning in terms of norms and rules, roles, landmarks and concrete ontological concepts.
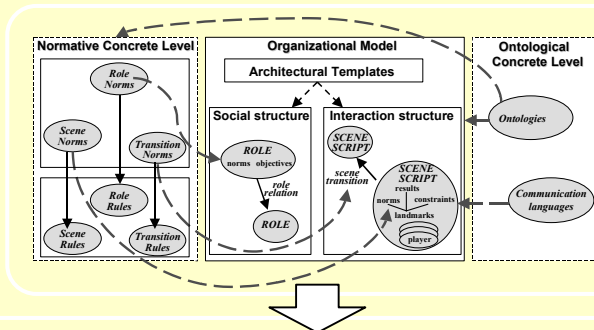
In this level the three dimensions are highly inter-connected: **norms** and **rules** in the normative dimension influence the **roles**, **groups** and **scenes** in the organizational model (see *tables 1 and 2*), while all terms are defined in the ontological dimension

The **Organizational Model**

The central element. Specifies the means to achieve the organization's objectives.

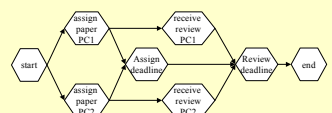*fig. 1* Role dependencies   *table 1* Role description   *figure 2* Interaction Structure   *table 2* Scene script   *figure 3* Scene interaction pattern

Implementation Level

The **Implementation Level** describes the implementation of the design in a given multi-agent architecture, including

• the mechanisms for **role enactment**,
• the mechanisms for **norm enforcement**,
• the implemented **ontologies**.

The **norm enforcement**

The normative dimension provides both the low-level **protocols** and the related **rules** that enable agents to comply with organizational norms.

The **role enactment**

Agent populations of the organizational model are described in the **Social Model** in terms of **social contracts** (commitments regulating the enactment of roles by individual agents). The **Interaction Model** describes the specific interactions such as agreed upon by agents in **interaction contracts**.

The **ontologies**

Specific Communication Acts cover the communication languages actually used by the agents as they agree in the interaction contracts. **Specific communicative acts** implement the content ontologies defined at the Concrete Level.