Chapter IV
Ontology Design for Interaction in a Reasonable Enterprise

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ABSTRACT
In this chapter we show a simple example of how different but complementary approaches to enterprise business interaction modeling (e.g., business process management, business objects, e-services, workflow management systems, etc.) can be reengineered and integrated within a same formal context. Our method is based on content ontology design patterns (CODePs), which provide a conceptual tool to build content modularly, and to describe an enterprise and its interactions in the same domain of discourse as its social and informational contexts. The objectives of our method include: (1) encoding the requirements from the communities of practice involved in business interactions; (2) reengineering and integrating existing languages and ontologies for business interaction; (3) creating a formal infrastructure to represent the dependencies between enterprises, social interaction and practices, legal regulations, and the physical world. As a result, entities like organizations, roles, social relationships, material resources, information objects, workflows, events, and so forth, are represented according to a set of modular, interoperable ontologies.

INTRODUCTION
Ontologies, intended as logical theories suitable to represent a domain of discourse, are the backbone of semantic technologies, including the Semantic Web. Domains of discourse may include entities conceived in the physical, social, or cognitive worlds: minerals, proteins, elevators, food, persons, organizations, human activities, legal norms, commercial transactions, recipes, ideas, mathematical entities, data, and so forth.
While there exist ontologies and logical theories/languages for enterprises and business objects, no conceptual framework has been developed so far which holds together the very different and heterogeneous entities involved in business interaction: organizations, roles, social relationships, communities, material resources, information objects, workflows, regulations, events, and so forth.

In order to “hold together” those entities, we need to define appropriate relations and axioms that govern their possible interactions. For example, what are the relations, and the restrictions on their use, between:

- An organization and the agents that act for it?
- Two persons who play two interdependent roles in a team?
- A contract and the workflows to define, sign, and enact it?
- The information from a text and its realizations, for example, in a file?
- A community and its members?
- An agent and an action that must be performed in order to achieve a task defined within a workflow?

The previous list includes just an excerpt of the many relations that underlie business interactions, and none of them is really specific of the business world. What is actually specific in business interaction is not the complex of those relations and their composition in real-world contexts. For example, even a basic business interaction, like two employees exchanging e-mails about an order, includes at least one organization, one team, one (maybe explicit) workflow, two roles, one task, one communication situation, the related information flowing in that situation, two text messages, and two agents performing a communication action.

One may wonder why we need all those types of entities in order to describe the ordinary fact of two employees who are exchanging e-mails about an order. The answer is straightforward: the relations between those entities distinguish two employees from any two humans, a sequence of goal-oriented actions from a set of nonintentional, accidental events, an organized community from a set whatsoever of agents. Those distinctions are acquired by cognitive agents during a lifelong learning, but in most cases are not available to information systems.

That said, one can still wonder why information systems need to go into that detail, instead of simply providing good communication channels and applications. This second question requires a more articulated answer, which will be given in the “roadmap” section of this chapter. The basic assumption here is that current organizations and enterprises are too complex for any management team to be governed without accessing the crucial, sensible knowledge of their community and the related processes. Selection and analysis of such information requires a move from information to knowledge processing. The main difference between information and knowledge is that the second allows inferences to be made, so that much more information, and in more flexible ways, is eventually available, not only to the management team, but to the entire community associated to an organization or enterprise.

Inferences do not only include traditional, deterministic logical inferences, but also probabilistic reasoning on unstructured text corpora, images, social networks, partial data sets, and so forth. While reasoning support for ontologies usually rests on deterministic logical inferences, it can be used to put together the heterogeneous data coming from those inferential processes, and to present appropriate views to a community whose members act for an enterprise. In other words, independently on the kind of inferential process required to gather new information from existing knowledge, the integration of that new information requires a common framework in order to assist rational agents in taking decisions and extracting relevant knowledge for a task.

Our objective in this chapter is to introduce methods and practices to formally describe that common framework, including enterprise-related entities, their identity, structure, functions, social relationships, and interaction aspects.