Chapter VIII
An Agent–Oriented Enterprise Model for Early Requirements Engineering

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ABSTRACT

This chapter introduces an agent-oriented enterprise model for conducting enterprise modeling during the early stages of information system requirements engineering. The enterprise model integrates a set of concepts and relationships that the analyst instantiates when building a model of the part of the organization in which the future information system will operate. The aim is to allow the analyst to produce an enterprise model which captures knowledge about an organization and its business processes, and which can be used to build an agent-oriented requirements specification of the future system and of its organizational environment. Compared to similar models, the present one integrates concepts and relationships allowing the analyst to capture the relevant intrinsic characteristics, such as autonomy and intentionality of human and software agents that are to participate in the future system.

INTRODUCTION

Business analysts and IT managers increasingly recognize that the ability to correctly and often extensively specify and analyze early requirements about an information system (IS) is critical for gaining organizational acceptance of the future system and achieving a close match between the expected
An Agent-Oriented Enterprise Model for Early Requirements Engineering

and observed quality thereof. Within the requirements engineering (RE) effort which initiates and subsequently guides the development and deployment of any IS within an organization, *early RE* is its first step, focusing on the representation and analysis of the organizational environment before the future system is introduced, dealing with the definition of desired behaviors and qualities of the future system that would fit this environment, and finally anticipating the effects that its introduction is likely to have on the performance of the organization. In order to analyze such organizational environments, it is necessary to understand the objectives, organizational processes, roles, and interdependencies of different stakeholders. Although errors and misunderstandings at this level are frequent and costly, early RE is usually done informally.

In this chapter, we propose to address this issue by suggesting a precisely and formally defined enterprise model to facilitate the modeling and analysis of early requirements for IS. This enterprise model allows the representation of the structures, organizational processes, resources, actors, work roles, behaviors, goals, and constraints of the organizational setting in which the future IS will function. It can be both descriptive and definitional, that is, spanning what is and what should be. One of its key characteristics is its support for the agent software engineering paradigm which allows developers to handle the life cycle of complex, distributed, and open systems required to offer open and dynamic capabilities in the latest generation of enterprise IS (see, e.g., Castro et al., 2002). By instantiating the concepts and relationships provided in the enterprise model, the analyst can:

- Analyze the current organizational structure and business processes in order to reveal problems and opportunities
- Evaluate and compare alternative organizational processes and structures
- Achieve common understanding and agreement between stakeholders (e.g., managers, owners, workers, etc.) about different aspects of the organization
- Build a database along the structure of the enterprise model for use in collecting, managing, and reusing the knowledge available in the organization

The proposed enterprise model draws on research in RE frameworks (e.g., Dardenne, van Lamsweerde, & Ficklas, 1993; Yu, 1994), management theory found to be relevant for enterprise modeling (e.g., Brickley, Smith, & Zimmerman, 2001; Johnson & Scholes, 2002; Simon, 1976; Uschold, King, Moralee, & Zorgios, 1997), and agent-oriented software engineering (e.g., Castro et al., 2002). It aims to reduce the semantic gap between enterprise and requirements representations, providing a conceptual foundation for modeling organizational IS. Through agent-orientation, our proposal advances current research results towards an integrative approach to the representation of human and organizational issues found relevant to the RE of organizational IS, all in the aim of arriving at a better understanding of the setting in which the IS will be used.

The following section motivates the use of the agent paradigm to model and design IS. The following sections gives an overview of related works, introduce the enterprise model, define and discuss all elements of the enterprise model, and, to increase precision, specify using the Z specification language. The final section summarizes the results and points to further work.

**AGENT-ORIENTATION IN ENTERPRISE MODELS FOR MODERN ORGANIZATIONAL IS**

The characteristics and expectations of new application areas for the enterprise such as electronic and mobile commerce, supply-chain management, peer-to-peer computing, or Web services are deeply affecting IS engineering. Most of the IS designed for these application areas are now concurrent and distributed. They tend to be open and adaptable in that they exist in a changing organizational and operational environment...
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