Chapter 4.17

Specifying Software Models with Organizational Styles

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ABSTRACT

Organizational Modeling is concerned with analyzing and understanding the organizational context within which a software system will eventually function. This chapter proposes organizational patterns motivated by organizational theories intended to facilitate the construction of organizational models. These patterns are defined from real world organizational settings, modeled in i* and formalized using the Formal Tropos language. Additionally, the chapter evaluates the proposed patterns using desirable qualities such as coordinability and predictability. The research is conducted in the context of Tropos, a comprehensive software system development methodology.

INTRODUCTION

Analyzing the organizational and intentional context within which a software system will eventually operate has been recognized as an important element of the organizational modeling process also called early requirements engineering (see e.g., (Anton 1996, Dardenne, van Lamsweerde & Fickas 1993, Yu 1995)). Such models are founded on primitive concepts such as those of actor and goal. This chapter focuses on the definition of a set of organizational patterns that can be used as building blocks for constructing such models. Our proposal is based on concepts adopted from organization theory and strategic alliances literature. Throughout the paper, we use i* (Yu 1995) as the modeling framework in terms of which the proposed patterns are presented

and accounted for. The research reported in this paper is being conducted within the context of the Tropos project (Giorgini, Kolp, Mylopoulos & Pistore 2004, Giorgini, Kolp, Mylopoulos & Castro 2005), whose aim is to construct and validate a software development methodology for agent-based software systems. The methodology adopts ideas from multi-agent system technologies, mostly to define the implementation phase of our methodology. It also adopts ideas from Requirements Engineering, where actors and goals have been used heavily for early requirements analysis. The project is founded on that actors and goals are used as fundamental concepts for modeling and analysis during all phases of software development, not just early requirements, or implementation. More details about Tropos can be found in (Giorgini et al. 2005). The present work continues the research in progress about social abstractions for the Tropos methodology. In (Kolp, Giorgini & Mylopoulos 2002*a*), we have detailed a social ontology for Tropos to consider information systems as social structures all along the development life cycle. In (Giorgini, Kolp & Mylopoulos 2002, Kolp, Giorgini & Mylopoulos 2002*b*, Kolp, Giorgini & Mylopoulos 2006), we have described how to use this Tropos social ontology to design multi-agent systems architectures, notably for e-business applications (Kolp, Do & Faulkner 2004). As a matter of fact, multi-agent systems can be considered structured societies of coordinated autonomous agents. In the present paper, which is a extended and revised version of (Kolp, Giorgini & Mylopoulos 2003), we emphasize the use of organizational patterns based on organization theory an strategic alliances for early requirements analysis, with the concern of modeling the organizational setting for a system-to-be in terms of abstractions that could better match its operational environment (e.g., an enterprise, a corporate alliance, . . .)

The paper is organized as follows. Section 2 describes organizational and strategic alliance theories, focusing on the internal and external structure of an organization. Section 3 details two organizational patterns – the structure-in-5 and the joint venture – based on real world examples of organizations. These patterns are modeled in terms of social and intentional concepts using the i* framework and the Formal Tropos specification language. Section 4 identifies a set of desirable non-functional requirements for evaluating these patterns and presents a framework to select a pattern with respect to these identified requirements. Section 5 overviews the *Tropos* methodology. Finally, Section 6 summarizes the contributions of the chapter and overviews related work.

STRUCTURING ORGANIZATIONS

Organizational structures are primarily studied by *Organization Theory* (e.g., (Mintzberg 1992, Scott 1998, Yoshino & Rangan 1995)), that describes the structure and design of an organization and *Strategic Alliances* (e.g., (Dussauge & Garrette 1999, Gomes-Casseres 1996, Morabito, Sack & Bhate 1999, Segil 1996)), that model the strategic collaborations of independent organizational stakeholders who have agreed to pursue a set of agreed upon business goals.

Both disciplines aim to identify and study organizational patterns that describe a system at a macroscopic level in terms of a manageable number of subsystems, components and modules inter-related through dependencies.

In this chapter, we are interested to identify, formalize and apply, for organizational modeling, patterns that have been already well-understood and precisely defined in organizational theories. Our purpose is not to categorize them exhaustively nor to study them on a managerial point of view. The following sections will thus only insist on patterns that have been found, due to their nature, interesting candidates also considering the fact that they have been studied in great detail in the organizational literature and presented as fully formed patterns.

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