



A 'context-aware' and agent-centric perspective for the alignment between individuals and organizations

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ABSTRACT

The enterprise modeling field aims at representing organizations from several, inter-related perspectives. A number of enterprise modeling frameworks have been developed providing models, methods and tools that enable to communicate the structure and processes of organizations. These frameworks have been used both for systems development and organizational analysis ends, where the latter mainly focuses process (re)design efforts. We argue that enterprise modeling frameworks can be used for other kinds of organizational analysis. In particular, they can be used to capture and model work practices, human multitasking at work, and to compare models describing pre-defined behavior with actual execution.

However, current enterprise modeling frameworks have several limitations in modeling human agents. First, these frameworks model generic behavior rather than behavior of specific individuals or groups. Second, they do not acknowledge the complex, situated and adaptive nature of human behavior. Third, these frameworks provide 'aerial' representations that ignore the process required to align the different and inconsistent views that human agents frequently have of the organization.

In this paper we (1) argue the importance of an agent perspective to align individual and collective views of the organization; (2) describe an ontology of organizational agents and contexts to overcome current limitations in modeling human agents; and (3) show the ontology benefits for organizational analysis ends, with results from case studies in real organizational settings. The ontology is part of a broader conceptual framework for the alignment between individuals and organizations, and provides an agent-centric and 'context-aware' perspective of the organization complementary to existing perspectives of enterprise modeling frameworks.

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1. Introduction and motivation

The present research is based on two main observations. First, there is no doubt around the dynamics and

uncertainty characterizing organizations and their environments. In a time when technology has made the world smaller and important events take place at an incredibly high pace, organizations constantly need to adapt themselves in order to survive. As a consequence, contemporary organizational thinking has evolved to embrace paradigms supported by constructivism and complexity-based principles. Constructivism is an intellectual paradigm that argues that reality is socially constructed

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through human communication. Complexity-based paradigms replace deterministic perspectives of the internal and external workings of organizations by perspectives based on emergence, self-organization and evolution [42]. In these paradigms, organizations are regarded as complex systems that emerge from the interactions among human and non-human agents.

Second, the evolution of the information systems (IS) field has been marked by the emphasis given to models and modeling activities as a means of facilitating the communication among systems stakeholders. The high inter-dependence between IS and organization's structure, culture and processes, as well as the need of aligning IS and organizations, has led to an expansion of the IS field that include organizational analysis and process (re)design activities as part of systems development efforts. From this expansion, emerged the *enterprise modeling* (EM) activity. EM research and practice have shown that enterprise models are effective communication tools in supporting systems development and process (re)design. A distinctive feature of EM frameworks is the representation of different enterprise concerns in terms of different but inter-related perspectives. The most commonly depicted enterprise perspectives are the *process*, *information*, *application*, and *technology* perspectives [54]. Whereas the former describes enterprise *activities*, i.e. what organizations do, the remaining perspectives describe its *resources*, i.e. the entities required for their operation. Another important feature of EM frameworks is the usage of languages with more formal syntax and semantics as well as graphical representations, which have shown to reduce ambiguous and inconsistent interpretations.

The new paradigm of organizational science draws attention to the need of creating and maintaining shared views of the organization and its members. From our point of view, EM can be valuable for this purpose. However, achieving it requires not only capturing and representing organizational processes and resources, but also uncovering and representing the actual behavior of its members, and identifying their relationships with processes and resources. Current EM frameworks have limitations in satisfying the latter two requirements. These limitations stem mainly from their mechanistic view of organizations. EM frameworks developed within computer-related fields are process-driven approaches, which describe organizations in terms of strategy, activity, and resource-related concepts. This focus on organizational processes, goals and resources, clearly belongs to the machine metaphor defined by Morgan [47]. The machine metaphor regards human agents as mere resources of processes. This way of modeling organizations does not reflect the complexity and adaptiveness of intelligent agents, neither it reflects the situated nature of their behavior. Furthermore, applying the machine metaphor results in a positivist view of reality. EM representations offer 'aerial' views supposedly shared by all the members of the organization, and the process required to share such views is completely disregarded. Consequently, EM frameworks have no means of reflecting the different and frequently incoherent views that different agents

have of the organization. Neither they support the process required to achieve agreements around particular views.

Our work aims at enhancing EM with a conceptual framework to facilitate the alignment between individuals and organizations, where such alignment refers to the degree to which views or understandings of the organization are shared among organizational members. This goal entails overcoming the aforementioned limitations of EM frameworks. Overcoming such limitations has conceptual and methodological implications. This paper addresses the conceptual implications through the definition of an ontology offering an agent-centric and 'context-aware' perspective, which works as a complement of current EM perspectives. The methodological implications are addressed in Zacarias et al. [73]. The proposed ontology redefines and reorganizes agent-related concepts to accommodate the new paradigm of organizational science. It also develops and includes a concept of context to address the situated and mediated nature of human behavior, and to connect the proposed perspective with the activity and resource perspectives provided by EM frameworks.

It should be emphasized that the main purpose of this work is to support organizational analysis and (re)design rather than the development of agent-oriented software. More specifically, the purpose of the proposed ontology is to use it as a tool to represent and analyze different behavioral concerns of human agents. Three types of usage have been devised, illustrated, and evaluated with case studies in real settings: (1) capturing and modeling individual and inter-personal work practices, (2) capturing and modeling human multitasking at work, and (3) aligning task design with actual execution. Hence, the conceptualization presented in this paper is mainly intended for human use, and aims at modeling *actual* rather than *prescribed* behavior. The remainder of this section explains the individual–organization alignment, as regarded in our work. Section 2 summarizes the theoretical background and related work. Section 3 describes the proposed ontology. Section 4 illustrates three ontology applications with case study results. Sections 5 and 6 give our conclusions and future directions.

1.1. EM as a tool for the individual–organizational alignment

The problem of aligning individuals and organizations has been acknowledged by several researchers. Agency theory [1] defines an agency relationship as a contract between two parties; the principal (integrated by one or more persons representing the organization), who engages another party (an individual defined as the agent) to perform some service on their behalf [33]. In agency theory, the alignment between individuals and organizations is regarded in terms of inducing an agent to maximize the 'principal's' goals. The theory focuses on determining the proper information flows and monitoring costs to achieve this purpose. The agency structure is applicable in a variety of settings, ranging from macro-level issues to micro-level inter-personal phenomena [20].

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