Abstract

A business domain is typically subject to various business rules. In practice, these rules may be of different modalities (e.g., alethic and deontic). Alethic rules impose necessities, which cannot, even in principle, be violated by the business. Deontic rules impose obligations, which may be violated, even though they ought not to be. Conceptual modeling approaches typically confine their specification of constraints to alethic rules. This chapter discusses one way to model deontic rules, especially those of a static nature. A formalization based on modal operators is provided, and some challenging semantic issues are examined from both logical and pragmatic perspectives. Because of its richer semantics, the main graphic notation used is that of object-role modeling (ORM). However, the main ideas could be adapted for UML and ER as well. A basic implementation of the proposed approach has been prototyped in Neumont ORM Architect (NORMA), a software tool that supports automated verbalization of both alethic and deontic rules.
Introduction

In the wider sense, an information system corresponds to a business domain or universe of discourse rather than an automated system. Business domains are constrained by various business rules, which specify required or desirable states of affairs or behavior. Business rules may be of different modalities (e.g. alethic and deontic). Alethic rules impose necessities, which cannot, even in principle, be violated by the business, typically because of some physical or logical law. For example, each employee was born on at most one date, or no product is a component of itself. Deontic rules impose obligations, which may be violated, even though they ought not to be. For example, it is obligatory that each employee is married to at most one person, and it is forbidden that any person smokes in any office.

Various information modeling approaches exist for modeling business domains at a high level, for example, entity-relationship (ER) modeling (Chen, 1976), the unified modeling language (UML; Object Management Group [OMG], 2003a, 2003b; Rumbaugh, Jacobson, & Booch, 1999), and object-role modeling (ORM; Halpin, 1989, 2001, 2006). However, these modeling approaches typically confine their specification of rules to those of an alethic modality, ignoring deontic rules. A notable exception is the proposal of Krogstie and Sindre (1996) to extend the Tempora approach to capture not only alethic rules (necessities) and deontic rules (obligations), but also recommendations (in their proposal, they include recommendations as a subclass of deontic rules, but we classify recommendations in terms of a different and weaker modality that is not discussed further here). While our approach is similar to that of Krogstie and Sindre in drawing upon the formalism of deontic logic, it covers new ground by considering the automated verbalization of deontic rules, applying the ideas within the context of ORM, and examining embedded deontics and other logical issues.

It is important for a business to have a clear understanding of all its rules, including deontic ones, whether or not the business chooses to enforce these rules or monitor violations of them by means of an automated system. In recognition of this need, as well as to facilitate the exchange of semantics between businesses, the OMG is currently finalizing a proposal to specify a business semantics layer on top of its software-specific layers (OMG, 2006).

The proposal that was accepted by the OMG for finalization is the Semantics of Business Vocabulary and Rules (SBVR) submission. As a contributor to this submission, the author focused on the formal logic underpinnings of
Modeling and Querying Temporal Data
www.igi-global.com/chapter/modeling-querying-temporal-data/11175?camid=4v1a

Semantic Heterogeneity in Multidatabase Systems: A Review and a Proposed Meta-Data Structure
www.igi-global.com/article/semantic-heterogeneity-multidatabase-systems/3321?camid=4v1a