Chapter XIV
Conceptual Modeling of Events for Active Information Systems

Salvatore T. March
Vanderbilt University, USA

Gove N. Allen
Brigham Young University, USA

ABSTRACT

Active information systems participate in the operation and management of business organizations. They create conceptual objects that represent social constructions, such as agreements, commitments, transactions, and obligations. They determine and ascribe attributes to both conceptual and concrete objects (things) that are of interest to the organization. Active information systems infer conclusions based on the application of socially constructed and mutable rules constituting organizational policies and procedures that govern how conceptual and concrete objects are affected when defined and identified events occur. The ontological foundations for active information systems must include constructs that represent concrete and conceptual objects, their attributes, and the events that affect them. Events are a crucial component of conceptual models that represent active information systems. The representation of events must include ascribed attributes representing data values inherent in the event as well as rules defining how conceptual and concrete objects are affected when the event occurs. The state-history of an object can then be constructed and reconstructed by the sequence of events that have affected it. Alternate state-histories can be generated based on proposed or conjectured rule modifications, enabling a reinterpretation of history. Future states can be predicted based on proposed or conjectured events and event definitions. Such a conceptualization enables a parsimonious mapping between an active information system and the organizational system in which it participates.
INTRODUCTION

Organizations and the information systems that support them are artificial and intentionally designed artifacts. Policies and procedures created by an organization determine how specifically defined and identified events affect the organization. Active information systems are designed to participate in the operation and management of organizations by implementing such policies and procedures. Events play a crucial role in such organizational processes. They are defined and identified for the purpose of initiating organizational processes among interacting participants.

The event commonly described as “the placement of a purchase order,” for example, is an intentional agreement between a customer and a vendor. It is artificially identified and used by each participant to initiate organizational processes. For instance, the vendor may create a conceptual object referred to as a sales order—which is identified by a sales order number—and described by the particulars of the agreement (e.g., payment terms, promised delivery date, FOB point, quantities and prices of products sold, sales tax rate, freight charges). The sales order may also initiate production, shipping, and billing processes. The customer, on the other hand, may create a conceptual object referred to as a purchase order, identified by a purchase order number and described by the particulars of the agreement. The purchase order may also initiate production and sales processes that depend on the receipt of the products on that purchase order. It may also initiate processes to reserve cash required to pay for the purchase.

The ontological definition of an “event” as a state-transition (Bunge 1977) has been widely used in conceptual modeling research (Wand and Weber 1990; Shanks, Tansley, and Weber 2003). This definition has resulted in the premise that an information system is fundamentally a state-tracking mechanism (Wand and Weber 1990). It proscribes the representation of events as entities (Wand, Story, and Weber 1999). A conceptual model based on such a premise can appropriately represent a passive information system (March and Allen 2007a), but it is inadequate in representing an active information system. Effective analysis and design of active information systems requires a more substantive ontological definition of an “event” as an identified causal occurrence (Geerts and McCarthy 2002; Davidson 1980; Casati and Varzi 1996; March and Allen 2007b). Such a definition results in the premise that an information system is fundamentally an event-processing mechanism (Allen and March 2003; March and Allen 2007a). It requires the representation of events as entities for those events in which the information system actively participates. The descriptions of such entities include (a) the organizational rules governing the event processing and (b) the data that describe the event. We contend that it is appropriate to represent events as entities at the conceptual level and argue that doing so is fundamental to the conceptual modeling of information systems that actively participate in organizational work systems (Alter 2003; Alter 2006).

Objects are described by functions that map to values. Such functions may represent properties that objects naturally possess, or they may represent attributes that are artificially ascribed to them. The set of values for the functions of an object at a point in time defines its state at that point in time. A person, for example, possesses the properties height and weight and is ascribed the artificial attribute’s name and Social Security number. The mapping functions for a particular person may map that person to the vector (height: 6 feet; weight: 230 lbs; name: Fredrick J. Smith; Social Security number: 001-01-0001) on March 15, 2006. Note that the values of height and weight are each observable: they can be measured at a point in time and they change according to natural laws (possibly influenced by behavior but ultimately outside of human control). The values of name and Social Security number are not observable: they cannot be measured per se and they are ascribed to the person and can be changed according to
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