

## Chapter 5.2

# Authority and Its Implementation in Enterprise Information Systems

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### ABSTRACT

The concept of power is inherent in human organizations of any type. As power relations have important consequences for organizational viability and productivity, they should be explicitly represented in enterprise information systems (EISs). Although organization theory provides a rich and very diverse theoretical basis on organizational power, still most of the definitions for power-related concepts are too abstract, often vague and ambiguous to be directly implemented in EISs. To create a bridge between informal organization theories and automated EISs, this article proposes a formal logic-based specification language for representing power (in particular authority) relations. The use of the language is illustrated by considering authority structures of

organizations of different types. Moreover, the article demonstrates how the formalized authority relations can be integrated into an EIS.

### INTRODUCTION

The concept of *power* is inherent in human organizations of any type. Power relations that exist in an organization have a significant impact on its viability and productivity. Although the notion of power is often discussed in the literature in social studies (Gulick & Urwick, 1937; Parsons, 1947; Friedrich, 1958; Blau & Scott, 1962; Peabody, 1964; Hickson et al., 1971; Bacharach & Aiken, 1977; Clegg, 1989), it is only rarely defined precisely. In particular, power-related terms (e.g., control, authority, influence) are often used

interchangeably in this literature. Furthermore, the treatment of power in different streams of sociology differs significantly. One of the first definitions for power in the modern sociology was given by Max Weber (1958): *Power is the probability that a person can carry out his or her own will despite resistance.* Weber and his followers (Dahl, Polsby) considered power as an inherently coercive force that implied involuntary submission and ignored the relational aspect of power. Other sociologists (Bierstedt, Blau) considered power as a force or the ability to apply sanctions (Blau & Scott, 1962). Such view was also criticized as restrictive, as it did not pay attention to indirect sources and implications of power (e.g., informal influence in decision making) and subordinate's acceptance of power. Parsons (1947) considered power as *"a specific mechanism to bring about changes in the action of organizational actors in the process of social interaction."*

Most contemporary organization theories explore both formal (normative, prescribed) and informal (subjective, human-oriented) aspects of power (Peabody, 1964; Clegg, 1989; Scott, 2001). Formal power relations are documented in many modern organizations and, therefore, can be explicitly represented in models on which enterprise information systems (EISs) are based. The representation of formal power in EISs has a number of advantages. First, it allows a clear definition of rights and responsibilities for organizational roles (actors) and a power structure. Second, based on the role specifications, corresponding permissions for information, resources and actions can be specified for each role. Third, explicitly defined rules on power enable the identification of violations of organizational policies and regulations. Fourth, data about power-related actions (e.g., empowerment, authorization) can be stored in an EIS for the subsequent analysis.

For modeling of power relations, the rich theoretical basis from social science can be used. Notably, many modern EISs implement no or very simplified representations of power relations and

mechanisms. In particular, the architecture ARIS (Scheer & Nuettgens, 2000) used for development of EISs identifies responsibility and managerial authority relations on organizational roles, however, does not provide general mechanisms for representing such relations and does not address change of these relations over time. The enterprise architecture CIMOSA (1993) distinguishes responsibilities and authorities on enterprise objects, agents, and processes/activities. However, no precise meaning (semantics) is attached to these concepts, which may be interpreted differently in different applications. Also, different aspects of authorities are not distinguished both in ARIS and in CIMOSA (e.g., authority for execution, authority for supervision, authority for monitoring).

Often EISs realize extensive access schemata that determine allowed actions for roles and modes of access of roles to information (Bernus, Nemes, & Schmidt, 2003). Normally, such schemata are based on power relations established in organizations. Thus, to ensure consistency, unambiguousness and completeness of EISs' access schemata, organizational power relations should be precisely identified and specified using some (formal) language. To this end, theoretical findings on organization power from social science are useful to consider. However, there is an obstacle to the direct implementation of this knowledge in EISs—the absence of operational definitions of power-related concepts in social theories.

The first step to make the concept of power operational is to provide a clear and unambiguous meaning for it (or for its specific aspects). In this article, this is done by identifying the most essential characteristics and mechanisms of power described in different approaches and by integrating them into two broad categories: formal power (or authority) and informal power (or influence), which are described in the Power, Authority and Influence section. Further, this article focuses on the formal representation of authority, for which a formal language is described in the Authority: A Formal Approach section. Moreover, this section

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