



Chapter X

Developing and Maintaining Knowledge Management Systems for Dynamic, Complex Domains

Lisa J. Burnell
Texas Christian University, USA

John W. Priest
University of Texas, USA

John R. Durrett
Texas Tech University, USA

ABSTRACT

An effective knowledge-based organization is one that correctly captures, shares, applies and maintains its knowledge resources to achieve its goals. Knowledge Management Systems (KMS) enable such resources and business processes to be automated and are especially important for environments with dynamic and complex domains. This chapter discusses the appropriate tools, methods, architectural issues and development processes for KMS, including the application of Organizational Theory, knowledge-representation methods and agent architectures. Details for systems development of KMS are provided and illustrated with a case study from the domain of university advising.

INTRODUCTION

An effective knowledge-based organization is one that correctly captures, shares, applies, and maintains its knowledge resources to achieve its goals. Knowledge Management Systems (KMS) enable such resources and business processes to be automated. Possibly the greatest benefits, but with the biggest challenges, emerge from creating KMS for environments with dynamic and complex domains (DCD). If knowledge is viewed as information applied in a particular context, then a dynamic domain is one in which information such as policies and procedures are subject to frequent change. A complex domain is one in which many interrelated policies exist with informally defined and tacit exceptions.

Typical parameters used to describe or classify organizational structures in any environment are centralization, hierarchy, and standardization. Dynamic and complex environments tend to coerce organizations into highly centralized, hierarchical structures with many strictly enforced standards-based rules of operation. This environment results in organizations wherein only a few experienced individuals have the knowledge and experience to cope with frequent change, exceptions, and their complex interrelationships. The rest of the organization is thus poorly informed and subject to making errors when employees must make decisions. Obviously, this highly centralized, hierarchical structure is the wrong approach for a knowledge-based organization. The organizational goal is to get the right knowledge to the right person at the right time so better decisions and fewer mistakes will be made. The knowledge management challenge is to support this goal through the development of KMS that can readily adapt to change while dealing with complexity. The emerging science of knowledge management should preserve and build upon literature that exists in other fields (Alavi & Leidner, 2001). We believe, and research on knowledge as a contingency variable (Birkinshaw, Nobel et al., 2002) indicates, that any KMS will benefit from the application of Contingency Theory (CT) and Information Processing Theory (IPT), both well established in the field of Organizational Theory (OT).

The chapter begins with the role of CT and IPT in examining the organizational aspects of dynamic, complex environments, followed by an overview of classic knowledge management and tools for KMS development. Next, the organizational, domain, development, maintenance, and KMS issues for dynamic, complex domain environments are presented. The recommended strategies and tools are illustrated through a case study of a recently developed university advising system, a classic case in which a few knowledgeable individuals (departmental advisors) attempt to serve a large population (students) in a dynamic, complex domain. Additional recommendations and future trends conclude the chapter.

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