Chapter IV

The Role of Data Mining in Organizational Cognition

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ABSTRACT

Data mining has quickly emerged as a tool that can allow organizations to exploit their information assets. In this chapter, we suggest how this tool can be used to support strategic decision-making. Starting with an interpretive perspective of strategy formulation, we discuss the role of beliefs in the decision-making process. Referred to as Micro-Theories (MTs), these beliefs generally concern some assumption regarding the organization's task environment, such as sales increasing in a certain segment or customers preferring a certain product. The strategic role for data mining, referred to as Organizational Data Mining (ODM) is then to provide validation for these beliefs. We suggest a four-step process for identifying and verifying MTs and illustrate this with a hypothetical example of a bank. Implications and future trends in ODM are discussed. Ultimately results of data mining should be integrated with strategic support systems and knowledge management systems.

INTRODUCTION

Data mining, the identification of useful patterns from historical data, is a step in the larger process of knowledge discovery in databases (KDD), which includes data preparation, selection, cleansing and interpretation of results as additional steps. The data to be mined is usually obtained from the company's transaction records or purchased externally from third parties. A mixture of techniques from artificial intelligence and statistics are used, including summarization, time series, regression, decision trees, rule induction and cluster analysis to name a few (Fayyad, Piatetsky-Shapiro, & Smyth, 1996). According to Nemati and Barko (2001), the majority of data mining applications (72 percent) are centered around predicting customer behavior. Business applications of mining have been in customer retention (Smith, Willis & Brooks 2000; Ng & Liu, 2000), predicting ingredient usage in fast food restaurants (Liu, Bhattacharyya, Sclove, Chen & Lattyak, 2001), effectiveness of marketing campaigns in fast food restaurants (Anonymous, 2001), and assessing the quality of health care (Hogl, Muller, Stoyan & Stuhlinger, 2001). These are operational and managerial applications in the sense that the results of such applications can be used to take specific actions, including offering discounts and incentives, modifying store layouts and reducing prices. In this chapter, we take the perspective that the role of data mining can be extended (viz. organizational data mining (ODM)) beyond managerial usage to supplementing strategic decision making in organizations. This would require viewing organizational data within the larger context of organization-environmental interactions. It is the objective of this chapter to introduce and elaborate on this strategic role and, additionally, to explore the linkages between the interpretation stage of KDD and knowledge management.

BACKGROUND

The strategic use of information technology is a mature concept in the information systems discipline. Sabherwal and King (1991) define a strategic application as one that has a profound influence on a firm's success, by either influencing or shaping the organization's strategy or by playing a direct role in the implementation or support of it. It is the former definition of a strategic application that we favor — the idea that data mining can contribute to the formation of the firm's strategy. Before examining this role, we will first review basic concepts of strategy and discuss the process by which it is formed.

Strategy is commonly defined as achieving a fit with the environment and matching capabilities with resources and environmental conditions (Kast & Rosenzweig, 1979). Organizations are subject to pressures from the environment, which originate from beyond the firm's boundaries. These pressures can arise from various sources, which can be classified into the task, institutional and general environments. The task environment is concerned with inputs and outputs relevant to the decision-making and transformation processes of the organization and can include suppliers, competitors, technologies and employees (Kast, 1980). It typically has influence on the performance of organizations. The supply of semiconductor memory, for instance, affects profitability of PC manufacturers.

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