Knowledge Management Systems: Implications and Opportunities for Data Warehousing

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Abstract

The convergence of KMS and data warehousing was considered one of the top twenty new developments of 1998 (Watson and Gray, 1998), but there is little research that exists that addresses this topic. In this article, we define the concept of organizational knowledge management (KMS) and then draw on the findings of two recent surveys of KM practices and emerging trends to describe the role of data warehousing in organizational knowledge management initiatives. The surveys asked executives from a variety of industries to define their firms’ KM systems and initiatives and define the expected benefits and potential barriers to their KM efforts. The survey findings lead to several important implications and opportunities for the area of data warehousing as an important component of the KMS infrastructure.

Background

An emerging line of information systems target knowledge workers (e.g., professionals and managers) by focusing on creating, gathering, organizing, and disseminating an organization’s “knowledge” as opposed to “information” or “data.” These systems are referred to as Knowledge Management Systems (KMS). Data is defined as facts and figures. Information is defined as data processed and interpreted into a meaningful framework (Vance, 1997). Knowledge refers to meaning and understanding that results from processing information by individuals. According to Maglitta (1996) knowledge is “information made actionable.” Thus, information and knowledge management activities and systems, while interrelated, are not equivalent.

Traditionally, data processing systems in organizations have focused on collecting and storing data resulting from organizational transactions. MIS have focused on meeting the management’s need for timely and accurate information, while knowledge management systems now attempt at capturing, storing, and disseminating an organization’s know-how and intellectual assets of firms.

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and communicating knowledge of employees so that other employees may make use of it to be more effective and productive in their work.

Organizations typically capture knowledge in their routines, procedures, documents, policies, rules, and regulations. Furthermore, knowledge is created and transferred in organizations through employee training and development programs. Although the concept of KM is not new—what is new and exciting in the knowledge management area is the potential of using modern information technologies like data warehousing to systematize, facilitate, and expedite firm-wide knowledge management.

Because KMS are just beginning to appear in organizations, there exists little research and insight to guide the successful development and implementation of such systems. Thus, in this article we review the findings of two recent KMS surveys to: 1) deepen understanding of the underlying concepts of knowledge management and
knowledge management systems and 2) identify the implications and opportunities for data warehousing as an important component of the KMS infrastructure. In fact, the convergence of data warehousing and knowledge management was among the top twenty new developments for data warehousing in 1998 (Watson and Gray, 1998).

Current and Emerging KM Practices

The findings of two recent KM surveys considerably deepens our understanding of the nature and scope of existing and planned KM initiatives in organizations and the potential role that data warehousing can play in relation to knowledge management systems. In one study conducted by Alavi and Liedner (1999), 109 CIOs, IS managers, and general and functional area executives who participated in an executive development program in July of 1997 were invited to participate in a KM survey. The participants in the program represented a cadre of vanguard organizations from twelve countries that represent companies with significant IT investments. These participants were attending a two-week residential executive development program on the management of information technology. They were asked to respond to a questionnaire that contained 13 questions consisting of short answers and multiple choice. A total of 50 usable responses were received for a response rate of 45.8 percent. The questionnaire tapped into the respondents’ perspectives on KMS, their perceptions of the current levels of KMS activities in their firms, and their concerns regarding these systems.

In another survey, conducted by the Ernst and Young's Center for Business Innovation in 1997, 431 U.S. and European firms characterized their current KM projects and described the perceived barriers to KM in their organizations (Ruggles, 1998). The outcomes of these surveys and their implications for data warehousing are described next.

Perspectives on Knowledge Management

One of the objectives of the survey study conducted by Alavi and Liedner (1999) was to explore the executives' perspectives on knowledge management. Three perspectives emerged. These perspectives were an information-centric perspective, a technology-centric perspective and an organizational-centric perspective. The information-centric perspective was primarily focused on information attributes such as timeliness, quantity, and form. That is, provision of the right amount of information at the right time in the right format was considered to be an important aspect of organizational knowl-

edge management processes. This perspective emphasized textual information format in addition to numerical records and reducing information overload as well as facilitating information retrieval and access.

The technology-centric perspective highlighted technological tools and approaches as important considerations to organizational knowledge management initiatives. Specific forms of information systems (e.g., executive information systems, and expert systems) and technologies (e.g., data warehousing, knowledge repositories, multi-media, and search engines) were identified as comprising knowledge management initiatives.

The third knowledge management perspective that emerged in the Alavi and Liedner survey was an organizational perspective. Under this perspective, knowledge management was viewed in terms of organizational learning, communication, organizational culture, and cultivation of organizational intellectual resources. Some managers in the survey viewed organizational factors comprising as much as 80 percent of the knowledge management issues (the remaining 20 percent of the issues consisting of technology and informational factors). Some executives who participated in the survey viewed an organizational culture conducive to knowledge sharing and development of intellectual assets as particularly significant to effective knowledge management.

Thus, no single and universally agreed upon perspective on knowledge management currently exits. To be successful, organizational KM initiatives should effectively integrate a variety of technical as well as organizational issues. An implication of this finding is that while data warehousing may be an effective approach in addressing the technical and some of the informational aspects of knowledge management, it should be effectively combined with an organizational perspective for successful organizational implementation. Furthermore, the informational perspective of KM goes beyond collection, management and dissemination of structured and quantitative data typically associated with data warehousing projects.

Current Knowledge Management Practices

To explore current organizational practices and to investigate the nature of high-priority KM initiatives, Ruggles (1998) asked the participants in his survey to identify their specific KM projects under way. The high-priority KM projects are displayed in Table 1. It is interesting to note that the most prevalent types of KM projects can be categorized into the three KM perspectives identified by Alavi and Liedner (1999). The technology-centric perspective includes the
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intranet, data warehousing, decision support systems, and groupware development projects. Creating knowledge worker networks, new knowledge roles, and new knowledge-based products and services relate to the organizational perspective. While projects focused on identifying sources of organizational knowledge correspond to the informational perspective. The consistency between the findings of the two surveys further emphasizes and reinforces the multifaceted nature of the knowledge management concept. Furthermore, both surveys identify data warehousing as a prevalent technology for KM that needs to be effectively integrated with the informational and organizational perspectives on knowledge management.

<table>
<thead>
<tr>
<th>Knowledge Management Projects</th>
<th>Percentage of organizations (sample size = 431)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating an intranet</td>
<td>47%</td>
</tr>
<tr>
<td>Data warehousing/knowledge repository</td>
<td>33%</td>
</tr>
<tr>
<td>Implementing decision support systems</td>
<td>33%</td>
</tr>
<tr>
<td>Implementing group support systems</td>
<td>33%</td>
</tr>
<tr>
<td>Creating network of knowledge workers</td>
<td>24%</td>
</tr>
<tr>
<td>Mapping sources of internal expertise</td>
<td>18%</td>
</tr>
<tr>
<td>Establishing new knowledge roles</td>
<td>15%</td>
</tr>
<tr>
<td>Launching new knowledge based products/services</td>
<td>14%</td>
</tr>
</tbody>
</table>

The implications of these findings for design of data warehouses are important in that the identified knowledge domains can point to potentially useful areas for development of data marts. A data mart is a scaled down version of a data warehouse that focuses on a particular subject area and is usually geared toward a specific business process (e.g., customer service). The knowledge domains of interest to executives identified in the Alavi and Liedner's survey thus provides some insights into the potentially high pay off areas for design of data marts.

Perceived Barriers to Knowledge Management

In both surveys (Alavi and Liedner, 1999; Ruggles, 1998), the respondents were asked to identify difficulties and barriers to knowledge management in organizations. In both surveys, the issues of top concern were organizational issues. More specifically, changing people behavior (convincing them to share knowledge instead of hoarding it) was identified as the top barrier to organizational knowledge management. Another challenge was justifying and establishing the value of knowledge management investments in organizations. In particular, development of meaningful metrics was frequently mentioned.

An informational concern was a desire to avoid overloading already taxed users with yet more information. There was also a mention of concern about customer and client confidentiality now that much information about customers and clients would be gathered and widely available in the organizations. It is important to note here that some of the capabilities provided by data warehousing tools (information filtering, and security and access control provisions) can be potentially useful in addressing these knowledge management concerns.
Implications and Opportunities for Data Warehousing

Considering the survey findings reviewed and discussed here, we next describe implications and opportunities for data warehouses as a tool for support of knowledge management efforts.

Data warehousing is expected to be a critical component of a company's KMS infrastructure.
Data warehouses, data mining, and decision support systems are among the top technologies that managers expect to support a KMS infrastructure; however, only recently has knowledge management surfaced as an important area in the data warehousing community (Watson and Gray, 1998). This suggests that there may be opportunities and synergies with KMS initiatives within organizations from which data warehousing professionals can benefit. Professionals need to learn how data warehousing can support KMS strategies and plans that exist in their companies.

Don't “push” data warehousing too hard.
Increasingly, end user access tool vendors are touting the “push” technology that their tools can provide. For example, products like Cognos Impromptu and Brio Enterprise incorporate the ability to deliver information, usually pre-filtered, to users via email and other convenient mechanisms. But, data warehousing professionals need to be careful when applying such tools because simply delivering or “pushing” information to the users' desktop may not be an effective knowledge management strategy.

Users must process information before it becomes knowledge, so in addition to just receiving information, individuals should also be motivated to convert it to knowledge (i.e., learn and internalize the information). Hence, knowledge is created and shared on the basis of “pull” by individuals and not a centralized technology-enabled “push” of information to desktops (Manville and Foote, 1996). Data warehouses need a balance of both push and pull to be effective for KMS.

Some warehouse areas may provide higher payoff in terms of KMS.
Most often data warehousing applications support sales and marketing, finance, forecasting, corporate planning, and accounting (Watson and Haley, 1997). The current study identified customer service, business partners, and internal operations as being the most important domains of knowledge in the organization, and knowledge on suppliers was indicated as the least important. This suggests that data warehouses that support KMS may have additional needs in terms of content from non-KMS repositories. DW professionals may want to consider these domains when conducting the information requirement process.

Be careful not to overload warehouse users.
In the studies mentioned, the respondents were concerned about overloading already taxed users with yet more information. Unfortunately, the data warehousing community may be creating reason for this concern. Many warehousing initiatives strive to provide end users with endless amounts of information and high-powered tools. Yet, most end users have fairly nominal information requirements, and their access tools have more functionality than is really needed (Eckerson, 1998).

Data warehousing is making strides in attempting to minimize information overload. Vendors continue their attempts to better understand the needs of the majority of end users and tailor their products to these needs. One recent breakthrough is the increasing use of mining and agent technology to sift through volumes of data and identify relevant information. This area has received increasing attention and should continue to mature in the near future (Watson and Gray, 1998).

Take advantage of Intranet technology.
The Intranet seems to be the primary means of displaying and distributing knowledge in organizations within the firms that participated in both of the surveys discussed here. Respondents reported the importance of configuring an effective technical infrastructure and architectural requirements in the face of highly dynamic technology. Using Intranet technology is one such way of keeping pace. Also, Intranet technology in warehousing can support people in and out of company without installing specialized software, reducing support and operations costs.

The data warehousing area has embraced Intranet technology. In fact, "the Web browser is now established as the client of choice for access and the favored application development environment." (Watson and Gray, 1998, p. 10). Companies like Southern California Gas have demonstrated the success of Intranet-based data warehouses (Kelly, 1997). This infrastructure appears to be highly conducive for supporting KMS initiatives.
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A data warehousing project needs to be explicitly linked to high value.

It is important to try to develop metrics to assess benefits of KMS. None of the organizations participating in the two surveys had conducted (or were planning to conduct) formal cost-benefit analysis for their KMS. However, the respondents felt that development of meaningful metrics for measuring the value, quality, and quantity of knowledge is a key factor for long-term success and growth of KMS. Unfortunately, studies have shown that quantifying data warehousing benefits is quite challenging, especially with high-level benefits like support for achieving strategic business objectives (Watson and Haley, 1998). Nevertheless, data warehousing projects need to be linked to explicit and important aspects of organizational performance (e.g., customer satisfaction, product/service innovations, time to market, cost savings, competitive positioning, and market shares, etc.). In other words, organizations need to find leverage points where enhanced “knowledge” can add value, and then develop data warehouses to add value through delivery of the required knowledge.

Conclusion

There is no doubt that data warehousing professionals need to understand knowledge management systems and their relationship with data warehousing technologies and strategies. The convergence of the two technologies offer great synergies and opportunities for organizations that expect employees to have access to knowledge that makes them more effective in their work. We expect to see much more research and practitioner attention on KMS and data warehousing emerge in the coming years.

REFERENCES


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