aiming to capture the entire set of metadata requirements and implement a centralized architecture.

Metadata quality. The design and initial implementation of the metadata layer is only the beginning. As organizations enhance their business activities or transition to new ones, information systems, the underlying data, and metadata must all be updated accordingly. Poor-quality metadata can result not only from poor analysis of requirements or from an invalid design approach but also from the failure to detect changes in the business and reflect them in the metadata layer. With metadata being at the functional core of information systems, poor quality might in turn degrade the quality of the data, cause operational failures, and violate information security. To keep metadata functional and its quality high, organizations need to invest in its ongoing administration and maintenance. Metadata must be constantly updated to reflect evolving changes in data models, business rules, information flow, end-user configuration, and underlying technology.

Metadata Research

Given these challenges, is metadata implementation worth the effort? If IT/IS researchers and practitioners understand only metadata's technical merits but not its business benefits, why should business managers care about metadata? Wouldn't it be reasonable for COTS product vendors to focus on technical metadata, designing it exclusively for IT professionals while ignoring the business decision makers? The answer is not obvious, as the benefits of metadata are not yet well known. Recent studies [1, 2, 6] suggest that metadata may significantly benefit business decision makers, hence, ought to be further explored by the academic research community.

Data-quality management is a promising area for metadata [9]. Due to the rapid growth of data volume and complexity, poor data quality represents a growing hazard to information systems. Metadata enables decision makers to gauge data quality and is critical for the administration of processes and security within decision-support environments (such as a data warehouse).

Managerial decision making stands to benefit from metadata [1, 2]. Understanding this benefit involves several questions:

- What types of decision making are most likely to benefit from metadata? Metadata is likely to be useful in rational, data-driven, analytical decision making scenarios. Not clear is whether it provides similar benefit in decision processes that are more intuitive or politically charged;
- How is that benefit influenced by the decision maker role? It would be reasonable to assume that a middle-tier manager and a CEO would each benefit, though in different ways; and
- What stages of the decision process benefit most from metadata? Decision making is a multi-stage process where preliminary cycles of elaboration and search for data may precede the final decision. Metadata may affect not only that decision but the efficiency of preliminary stages of data exploration as well.

Securing organizationwide support is typically the greatest challenge in any successful metadata implementation. Such support cannot be achieved without identifying and communicating the merits of metadata to the technical community, to business users, and to corporate decision makers alike. Those merits, however, as well as the drawbacks, have yet to be fully explored, and many questions remain to be answered before metadata value is fully known. C

References

1. Even, A., Shankaranarayanan, G., and Watts, S. Enhancing decision making with process metadata: Theoretical framework, research tool, and exploratory examination. In *Proceedings of the 39th Hawaii International Conference on System Sciences (HICSS-39)* (Kauai, HI, Jan. 4–7). IEEE Press, Los Alamitos, CA, 2006.
2. Fisher, C., Chengalur-Smith, I., and Ballou, D. The impact of experience and time on the use of data quality information in decision making. *Information Systems Research 14,* 2 (June 2003), 170–188.
3. Jarke, M., Lenzerini, M., Vassiliou, Y., and Vassiliadis, P. *Fundamentals of Data Warehouses.* Springer-Verlag, Heidelberg, Germany, 2000.
4. Kimball, R., Reeves, L., Ross, M., and Thornthwaite, W. *The Data Warehouse Lifecycle Toolkit.* Wiley Computer Publishing, New York, 2000.
5. Marco, D. *Building and Managing the Meta Data Repository: A Full Lifecycle Guide.* John Wiley and Sons, Inc., New York, 2000.
6. Nevo, D. and Wand, Y. Organizational memory information systems: A transactive memory approach. *Decision Support Systems 39,* 4 (June 2005), 549–562.
7. Sen, A. Metadata management: Past, present, future. *Decision Support Systems 37,* 1 (Apr. 2004), 151–173.
8. Shankaranarayanan, G. and Even, A. Managing metadata in data warehouses: Pitfalls and possibilities. *Communications of the AIS 14,* 13 (Sept. 2004), 247–274.
9. Shankaranarayanan, G., Ziad, M., and Wang, R. Managing data quality in dynamic decision-making environments: An information product approach. *Journal of Database Management 14,* 4 (Oct.–Dec. 2003), 14–32.
10. Vaduva, A. and Vetterli, T. Metadata management for data warehousing: An overview. *International Journal of Cooperative Information Systems 10,* 3 (Sept. 2001), 273–298.

Ganesan Shankaranarayanan (gshankar@bu.edu) is an assistant professor in the Boston University School of Management, Boston, MA.

Adir Even (adir@bu.edu) is a Ph.D. student in the Information Systems Department at the Boston University School of Management, Boston, MA.