Chapter XII

Semantically Modeled Databases in Integrated Enterprise Information Systems

Cheryl L. Dunn
Florida State University, USA

Severin V. Grabski
Michigan State University, USA

INTRODUCTION

In the past several years, huge investments have been made in enterprise resource planning (ERP) systems and related applications. While the integrated database and data warehouse in such systems provides value, more value could be realized if the databases could more semantically reflect the underlying reality of the organization. Inter-enterprise commerce can be facilitated with the use of ontologically based systems with common semantics (Geerts and McCarthy, 2000; Haugen and McCarthy, 2000) instead of reliance on electronic data interchange (EDI) standards. This chapter presents a normative semantic model for enterprise information systems that has its roots in transaction processing information systems. Empirical research on semantically modeled information systems is reviewed and an example company's semantic model is provided as a proof of concept. This model is used as the basis for a discussion of its application to ERP systems and to inter-organizational systems. Future trends and research directions are also discussed.

Semantically modeled databases require their component objects to correspond closely to real-world phenomena and preclude the use of artifacts as system primitives (Dunn and McCarthy, 1997). Semantically modeled enterprise information systems allow for full integration of all system components centered on a single integrated database and facilitate the joint use of information by decision-makers. Researchers have advocated semantically designed information systems because they provide benefits to individual decision-makers (Dunn and Grabski, 1998, 2000) and because they facilitate organizational productivity and inter-organizational communication (Cherrington et al., 1996; David, 1995; Geerts and McCarthy, 2000).

Many organizations have invested immense sums of money in enterprise resource planning (ERP) systems and associated "bolt-on," applications such as customer relationship management (CRM) and advanced planning systems (APS). Much of the value of these ERP systems is in the integrated database and the associated data warehouse that is implemented. Unfortunately, a significant portion of the value is lost if the database is not a semantic representation of the organization. This value is lost because relevant information needed to reflect the underlying reality of the organization's activities is either not stored in the system at all, or it is stored in such a way that the underlying reality is hidden or disguised and therefore can't be interpreted.

Ontologically based systems with common semantics are regarded as a necessity to facilitate inter-organizational information systems (Geerts and McCarthy, 2000). This is critical, as business-to-business e-commerce becomes a major component of the economy. Presently, most inter-organizational data is sent via EDI (which requires very strict specifications as to how the data are sequenced and requires some investment by adopting organizations). The same requirement holds true for Web-based systems. There is no or very limited knowledge inherent in those systems. Alternatively, if trading partners implement systems based on the same underlying semantic model, many of the current problems can be eliminated.

This chapter first presents a normative semantic model for enterprise information systems that has its roots in transaction processing information systems. We use this model because the majority of information processed and tracked by information systems is transactional in nature. We review empirical research on semantically modeled information systems and then provide an example company's semantic model as a proof of concept. Then, we discuss how this model can be applied to ERP systems and to inter-organizational systems. We present issues and controversies associated with the model and discuss how the single company model can be extended into an inter-organizational system. Finally, we present future trends and research directions associated with this model and with inter-organizational systems in general, and provide concluding comments.

SEMANTIC MODEL DEVELOPMENT

In this chapter, similar to David et al. (1999), we are interested in an information system that captures, stores, manipulates and presents data about an organization's

Related Content

Design and Representation of Multidimensional Models with UML and XML Technologies

Juan Trujillo, Sergio Lujan-Moraand Il-Yeol Song (2005). *Advanced Topics in Database Research, Volume 4 (pp. 50-95).*

www.irma-international.org/chapter/design-representation-multidimensional-models-uml/4368

Common Sense Reasoning in Automated Database Design: An Empirical Test

Veda C. Storey, Robert C. Goldsteinand Jason Ding (2002). *Journal of Database Management (pp. 3-14).*

www.irma-international.org/article/common-sense-reasoning-automated-database/3272

From Chinese Philosophy to Knowledge Discovery in Databases A Case Study: Scientometric Analysis

Pei Liuand Eric Boutin (2009). *Handbook of Research on Innovations in Database Technologies and Applications: Current and Future Trends (pp. 632-642).*

www.irma-international.org/chapter/chinese-philosophy-knowledge-discovery-databases/20749

A Scalable Middleware for Web Databases

Athman Bouguettaya (2009). *Selected Readings on Database Technologies and Applications (pp. 252-267).*

www.irma-international.org/chapter/scalable-middleware-web-databases/28556

Enhancing UML Models: A Domain Analysis Approach

Iris Reinhartz-Bergerand Arnon Sturm (2008). *Journal of Database Management (pp. 74-94).*

www.irma-international.org/article/enhancing-uml-models/3382