An Empirical Research on Semantic Data Modeling: Comparison between Patterns and Ontology

E-mail: 9222553@mail.dyu.edu.tw

ABSTRACT

Semantic data modeling is an important communication tool used in the requirements analysis phase of a database-oriented information system development. This research conducted an experimental design to compare two semantic data models: Data Model Patterns by Hay (1996) and Ontology by Wand et al. (1999). The purposes of this research are (1) to compare the theoretical bases of the two data models, (2) to compare the degree of consistency among models provided by the participants, (3) to compare the degree of comprehension of the participants, (4) to make conclusions and provide practical advices for practitioners. Our research results show that Data Model Patterns (Hay 1996) are superior to Ontology (Wand et al. 1999) in both consistency and comprehension dimensions. The future research can include the investigation of the roles of different conceptual models when they are applied to the evaluation of enterprise resource planning (ERP) packages. Data Model Patterns need to be rigorously studied in the future regarding more precise guidelines.

Keywords : Semantic data models, Data Model Patterns, Ontology.

Table of Contents

REFERENCES

[1]   (85)   :   .

[2]   (89)   .

[3]   (87)   .

[4]   (87)   .

[5] Barker R., CASE*METHODTM: Entity Relationship Modeling, Oracle Corporation UK Limited, Addision-Wesley Publishing Company, 1992.

[6] Batra, D., Hoffer, J.A., and Bostrom, R., A comparison of user performance between the relational and the extended entity relationship models in the discovery phase of data base design, ACM Commun., (33, 2), p.126-139, Feb. 1990.

[7] Biller H. and Neuhold E., Concepts for the conceptual schema, In Architecture and Models in Data Base Management Systems, G. Nijssen, Ed. North-Holland, Amsterdam, p.1-30, 1977.

[8] Bunge, M. Treatise on Basic Philosophy: Vol. 3: Ontology I: The Furniture of the World. D. Reidel Publishing Co., New York, 1977.

[9] Bunge, M. Treatise on Basic Philosophy: Vol. 4: Ontology II: A World of Systems. D. Reidel Publishing Co., New York, 1979.

[10] Chan, H.C., Wei, K.K., and Siau, K.L., User-Database Interface: The Effect of Abstraction Levels on Query Performance, MIS Quarterly, p.441-464, Dec. 1993.

[11] Chen P. P., The entity-relationship model-toward a unified view of data, ACM Trans. on Database Systems (TODS), (1, 1), p.9-36, March 1976.

[12] Davis G. B. and Olson M. H., Management Information System: Conceptual Foundations, Structure, and Development, 2nd Edition, McGraw-Hill Book Co., 1985.

[13] Drucker P. F., The Discipline of Innovation, HBR, p.95-103, August, 2002.

[14] Gomez-Perez, A. and Corcho, O., Ontology languages for the Semantic Web, IEEE Intelligent Systems, (17, 1), p.54-60, Jan/Feb 2002.

[15] Hammer M. and Mc Leod D., Database description with SDM: a semantic database model, ACM Trans. on Database Systems (TODS), (6, 3), p.351-386, Sept. 1981.

[16] Hay D. C., Data Model Patterns : Conventions of Thought, Dorset House Publishing, New York.

[17] Hendler, J., Agents and the Semantic Web, IEEE Intelligent Systems, (16, 2) , p.30-37, Mar/Apr 2001.

[18] Jarvenpaa S. and Machesky J., End user learning behavior in data analysis and data modeling tools, In Proceedings of the 7th International Conference on Information Systems (San Diego, Calif.), p.152-167, 1986.

[19] Juhn S. and Naumann J., The effectiveness of data representation characteristics on user validation, In Proceedings of the 6th Int. Conf. on Information Systems (Indianapolis Ind.), p.212-226, 1985.

[20] Karp, R., Chaudhri V., and Thomere J., "XOL:An XML-Based Ontology Exchange Language(version 0.4)," Aug. 1999, www.ai.sri.com/~pkarp/xol (current Jan. 2002).

[21] Kent R., Conceptual Knowledge Markup Language (version 0.2). 1998. www.ontologos.org/CKML/CKML%200.2.html (current Jan. 2002).

[22] Kim Y. G. and March S. T., Comparing Data Modeling Formalisms, ACM Commun., (38, 6), p.103-115, June 1995.

[23] Lassila O. and Webick R., "Resource Description Framework (RDF) Model and Syntax Specification." W3C Recommendation, Jan. 1999,www.w3.org/TR/PR-rdf-syntax (current Jan. 2002).

[24] Leitheiser R., An examination of the effects of alternative schema descriptions on the understanding of database structure and the use of a query language, Ph.D. dissertation, Univ. of Minnesota, Minneapolis, 1988.

[25] Navathe S. B., Evolution of Data Modeling for Database, ACM Commun., (35, 9), p.112-123, Sep. 1992.

[26] Polanyi M., The Logic of Tacit Inference, Philosophy, (41, 155), p.1-18, 1966.

[27] Ridjanovic D., Comparing quality of data representation produced by nonexperts using logical data structures and relational data models, Ph.D. dissertation, Univ. of Minnesota, Minneapolis, 1986.

[28] Rodgers U., Oracle: A Database Developer's Guide, Prentice-Hall Inc., 1991.

[29] Shoval P. and Even-Chaime M., Database schema design: An experimental comparison between normalization and information analysis, Database (18, 3), p.30-39, Spring 1987.

[30] Shoval, P. and Shiran, S., Entity-relationship and object-oriented data modeling---an experimental comparison of design quality, Data & Knowledge Engineering, (21,3), p.297-315, Feb. 1997.

[31] Smith J. M. and Smith D. C. P., Database Abstractions: Aggregation and Generalization, ACM Trans. on Database Systems (TODS), (2,2), p.105-133, June 1977.

[32] Tan C.Y. and Maciejowski J. M., Semantic data models-an alternative to objects for simulation, Object-Oriented Simulation and Control, IEE Colloquium, P.6/1-6/4, 1991.

[33] Wand Y., Storey, V.C., and Weber, R., An Ontological Analysis of the Relationship Construct in Conceptual Modeling, ACM Trans. on Database Systems (TODS), (24,4), p.494-528, Dec. 1999.

[34] Wand, Y. and Weber, R. "Research Commentary: Information Systems and Conceptual Modeling-A Research Agenda," Information Systems Research (13,4), p.363-376. 2002.

[35] Whitten J. L. and Bentley L. D., Systems analysis and design methods, McGraw-Hill, Inc. 1998.