In the past few years, object-oriented (O-O) conceptual data modeling has emerged as an alternative to the traditional technique of entity-relationship modeling. O-O modeling is based on the premise that the resulting models are easier to use and understand. However, most claims of O-O modeling superiority are not empirically verified. Previous studies in this area have focused on a database modeler’s ability to create conceptual data models from a written description, but the concept of understanding a completed data model by a database designer has not been investigated. Thus, this study explores a database designer’s ability to understand an O-O conceptual data model – the Object Modeling Technique (OMT) – compared to an E-R model – the extended-entity-relationship model (EER). The OMT and EER conceptual data modeling techniques are compared using three modeling performance criteria: (1) model understanding; (2) time to understand; and (3) perceived ease-of-use. Results of this study indicate that the only difference between the two techniques is in the time to understand – OMT is significantly faster for both simple and complex problems.

The field of object-oriented (O-O) technology is growing rapidly. From a $200 million market in 1990, the O-O market is expected to hit $3.5 billion in a few short years (Khoshafian, 1993). Spanning research and practice from programming languages to systems analysis and design to database systems, almost all areas of systems development have been touched by the concepts of O-O. Although research continues to develop new areas within O-O, many recent efforts are aimed at testing and evaluating the fledgling technologies.

One of the newest areas (circa, mid-1980’s) within O-O is the concept of O-O databases (Khoshafian, 1993). Most fields of database management – from the development of new forms of databases to new methods of data modeling – are feeling the influence of O-O. In particular, the growing interest in O-O has spawned the growth of several O-O conceptual data models. It is believed that O-O conceptual data models, compared to other conceptual data models (e.g., the entity-relationship model), more closely represent reality and, consequently, provide a higher degree of modeling correctness and understanding (Bock and Ryan, 1993).

However, most claims of O-O modeling superiority are not empirically verified. Additionally, previous studies in this area have focused on a database modeler’s ability to create models from a written description (i.e., model correctness), but the concept of understanding a completed data model by a database designer has not been investigated. Thus, the purpose of this study is to empirically compare an O-O conceptual modeling technique to a more traditional technique based on the entity-relationship (E-R) model. Specifically, this study investigates an entry-level database designer’s ability to understand an O-O conceptual data model, compared to an E-R model.

Background and Related Research

In database design, a primary criterion for evaluating a design is understandability (Blaha, et al., 1988): can end-users, database designers, and original modelers understand
the structure of the database? The conceptual data model serves as the bridge between users and database professionals; thus, the ability to understand the data model, by each party, is particularly important. The ultimate success of the project is dependent on the accuracy of the data model (Jarvenpaa and Machesky, 1989).

It is during the translation of requirements from user to database modeler that many errors occur. Often forgotten, however, are the errors that occur in communication among database professionals via the data model. Potential problems occur because the conceptual data modelers may not be responsible for implementing the design; thus, the designers of the implementable data model must be able to read and understand the conceptual data model. And, because the data model is often used as part of the system documentation, the data model should be clear and understandable to designers that may need the model later (Campbell, 1992).

**Related Research**

To this point, prior research has primarily investigated a data modeler’s or end-user’s ability to develop a conceptual or implementable data model from a written problem description. A sample of these articles is discussed next.

Several studies have compared a conceptual data model to an implementable data model. A study by Jih, et al., (1989) compared E–R and relational data models by looking at an end-user’s query writing ability as measured by syntax errors, semantic errors, and time needed to write the query. No significant differences were found between the two techniques. Batra, et al., (1990), compared the extended-entity-relationship (EER) and relational models in the areas of modeling correctness and ease-of-use. For the experiment, end-users were asked to create models from a problem description. Results indicated that EER was significantly better on three of the six constructs used to measure modeling correctness. Ease-of-use was not significantly different between the two methods.

Other studies have compared various forms of conceptual models. Using a problem description as the task and end-users for subjects, Sheng and Higa (1990) compared the Structured Object Model (SOM), EER, and the normalization technique. The criteria for evaluation was design accuracy, design speed, and learning speed. Their results indicated that the graph based methods (SOM and EER) provided greater design accuracy and were easier to learn. A recent study by Bock and Ryan (1993) compared modeling correctness between the EER model and Kroenke’s O–O model. Entry-level IS professionals created conceptual data models from a written description (the same description used in Batra, et al.’s (1990) study). EER was significantly better on three of the eight constructs used to measure model correctness.

Noticeably absent from this sampling of related research is research which investigates the understanding of the conceptual data model after it has been created (i.e., communication between database professionals). Thus, the focus of this study: a comparison of two conceptual models (O–O and E–R) with regard to a database designer’s ability to understand the models.

**Research Model**

The research model used to guide this study is shown in Figure 1. Originally proposed by Jenkins (1982), the model has been modified to accommodate the study of data modeling performance (Batra, et al., 1990; Bock and Ryan, 1993). As seen in Figure 1, the focus of this study is on the data model’s impact on performance (i.e., the data model is the independent variable of interest). The human and task variables are controlled.

**Data Models**

Many different data models exist for both EER and O–O modeling. Thus, specific models from each of these...
Related Content

[www.igi-global.com/chapter/semantics-mibml-conceptual-modeling-grammar/4289?camid=4v1a](www.igi-global.com/chapter/semantics-mibml-conceptual-modeling-grammar/4289?camid=4v1a)

The Impact of Conceptual Data Models on End-User Performance
[www.igi-global.com/article/impact-conceptual-data-models-end/51109?camid=4v1a](www.igi-global.com/article/impact-conceptual-data-models-end/51109?camid=4v1a)

Metrics for Workflow Design: How an Information Processing View on Business Processes Helps to Make Good Designs
[www.igi-global.com/chapter/metrics-workflow-design/4355?camid=4v1a](www.igi-global.com/chapter/metrics-workflow-design/4355?camid=4v1a)

INDUSTRY AND PRACTICE: The Changing Mission of the Data/Information Profession
[www.igi-global.com/article/industry-practice-changing-mission-data/51187?camid=4v1a](www.igi-global.com/article/industry-practice-changing-mission-data/51187?camid=4v1a)