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An important feature of many conceptual modeling grammars is the set of constraints they provide to allow analysts to show that real-world things *may* or *may not* possess a particular property. In the entity-relationship model, for example, the fact that a thing may not possess a property (the property is optional) can be represented by showing the minimum cardinality of a relationship or an attribute is zero (Batini, Ceri and Navathe 1992). Whether this practice should be followed, however, is a contentious issue because it may obfuscate the semantics of the real-world domain that is being modeled. An alternative approach is to eliminate optional properties from conceptual schema diagrams by using subtypes that have only mandatory properties (Weber and Zhang 1996). A problem with this approach, however, is that it often leads to more complex conceptual schema diagrams because they include more elements to represent the additional subtypes needed.

Based on Bunge's (1977) theory of ontology, Collins and Quillian's (1969) theory of semantic networks, and Anderson and Pirolli's (1984) theory of spreading activation, we provide an analysis that leads us to predict that uses of subtypes with mandatory properties in conceptual schema diagrams will communicate the meaning of the real-world domain to users better than use of optional properties in conceptual schema diagrams. We are currently conducting a multi-trial free-recall experiment to test this prediction. In our experiment, information technology students who have successfully completed at least one course in conceptual modeling are being shown a conceptual schema diagram for three minutes, then having the diagram removed, and then being asked to redraw the diagram from memory. To control for transient learning strategies and to test how well participants understand the semantics embedded within a diagram, this procedure is repeated four times. There are two between-subjects factors. The first, "type of representation," is at two levels: either optional properties or subtyping with only mandatory properties has been used in a conceptual schema diagram. The second, "domain complexity," also has two levels: either simple or complex. Forty participants are undertaking the experiment: ten for each of the four treatments. Participants' level of domain understanding is being measured by how accurately they recall the conceptual schema diagrams.

If our predictions are confirmed, we have support for a particular ontological theory of information systems that we are using to evaluate conceptual modeling grammars. We also have prescriptions for practice in terms of how to represent real-world domains via conceptual models. Preliminary results, however, provide mixed support for our prediction. On the one hand, the optional property groups appear to be performing better during the first one or two recall trials, presumably because their diagrams have fewer elements to remember. By the third and fourth trials, however, the differences between the optional property and subtying groups seem to have dissipated. Thus, the subtying groups appear to be learning more rapidly than the optional properties groups and perhaps this result manifests some support for our prediction.

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