MISQ Archivist

Exploring the Effects of Extensional Versus Intensional Representations on Domain Understanding

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Abstract

Cognitive research suggests that understanding the semantics, or the meaning, of representations involves both ascension from concrete concepts denoting specific observations (that is, extension) to abstract concepts denoting a number of observations (that is, intension), and vice versa. Consonantly, extant conceptual schemas can encode the semantics of a domain *intensionally* (e.g., ER diagram, UML class diagram) or *extensionally* (e.g., set diagram, UML object diagram). However, prior IS research has exclusively focused on intensional representations and the role they play in aiding domain understanding. In this research, we compare the interpretational fidelity of two types of representational encoding of cardinality constraints, an intensional schema using an ER diagram and its extensional analog using a set diagram. We employ cognitive science research on concepts to conceptualize that extensional representations will enable enhanced understanding as compared with intensional representations. Further, given that prior research suggests that the semantics of cardinality constraints remain challenging to understand, we focus on mandatory and optional cardinality constraints associated with relationships in these representations. Based on our laboratory experiments, we find that understanding with an extensional representation was (1) at least as good as that with an intensional representation for mandatory cardinality constraints and (2) significantly better for optional cardinality constraints. We also conducted an applicability check of our results via focus groups and found support for the perceived significance of extensional representations in practice. Overall, this research suggests that the tradition in IS research of exclusively focusing on intensional encoding of domain semantics should be reexamined.

Keywords: Intensional representation, extensional representation, domain understanding, conceptual modeling, cardinality constraints, laboratory experiment, applicability check