

Effects of Domain Familiarity on Conceptual Modeling Performance

Jihae Suh, Seoul National University, Seoul, South Korea

Jinsoo Park, Seoul National University, Seoul, South Korea

ABSTRACT

Conceptual modeling is currently considered a significant phase in information systems development. Several modeling grammars and methods have been studied extensively in the information systems discipline. However, previous research on conceptual models has focused on certain grammar (syntax) or discovering a way to deliver the meaning of a model (semantic) more clearly and completely. With regard to the construct overload issue in conceptual modeling, past studies have had some deficiencies in research methods and even presented contradicting results. The objective of the present study is twofold. First, the authors researched the interaction effect among syntax, semantics, and pragmatics to discover the preferred design, context, and user knowledge with which models are more likely to be understood or interpreted. Second, they performed an experiment to reconcile conflicting outcomes and acquire a more complete and accurate understanding of construct overload. Specifically, the authors focused on understanding the end users' modeling performance between ontologically clear and unclear models. They applied an improved experimental methodology that integrates three features (i.e., syntax, semantic, pragmatic) rather than treat them individually and employs different degrees of domain familiarity in the conceptual model (i.e., familiar domain vs. unfamiliar domain). The result of this study will broaden the perspective on usability in the context of the conceptual model and may serve as a modeler's ontological guidance in terms of whether or not to contain construct overload when they create a model. In addition, this study makes the theoretical contribution by verifying the domain extensibility towards the theory of ontological clarity.

KEYWORDS

Conceptual Model Grammars, Conceptual Modeling, Construct Overload, Domain Familiarity, Domain Knowledge, Empirical Research, Entity Relationship Diagram (ERD), Information Systems Development, Ontological Clarity

1. INTRODUCTION

Conceptual modeling is an activity performed during information systems (IS) development and maintenance to represent certain semantics of real-world domains (Weber, 2003). It is motivated by a single goal: providing an accurate and complete representation of someone's or some group's understanding of a domain (Bodart et al., 2001). It has become a conventional research theme in the IS discipline (Bera et al., 2014; Siau and Rossi, 2011) and industry (Fettke, 2009). Owing to

DOI: 10.4018/JDM.2017040102

Copyright © 2017, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

the increasing importance of databases in the business domain and the unique characteristics of modeling that require both theoretical and empirical examination, it has captured the interest of many researchers. Although database management inside and outside an organization is becoming critical, the grammars and methods used for conceptual modeling vary depending on the user or project (Topi and Ramesh, 2002), and there are some controversial issues such as construct overload and construct excess that remain to be resolved (Wand and Weber, 2002). In addition, previous research on conceptual modeling seems to have focused on the individual effects of syntax (i.e., constructs in the grammar), semantics (i.e., meaning of the construct), and pragmatics (i.e., context or domain in which a grammar is used) independently (Burton-Jones et al., 2009).

In the context of grammars and methods, construct overload, especially the part-whole relationship, remains a problem because alternative representations in conceptual models have been proposed. Based on the theory of ontological clarity provided by Wand and Weber (1993), Shanks et al. (2008)¹ concluded that the ontologically clear model allows users to better understand a domain, which indicates that a distinction needs to be made between an entity and a relationship. However, Allen and March (2012) came to the opposite conclusion of Shanks et al. (2008) and argued that no distinction is needed between an entity and a relationship. The representation of the part-whole relation as a relationship or an entity remains an issue to be resolved, and these conflicting viewpoints were published in the same issue of *MIS Quarterly* in September 2012. To reconcile the inconsistent results of the conceptual modeling research described above, this study sought a more convincing and clear experiment to be performed.

In light of previous research on conceptual modeling, most studies have focused on the semantics (i.e., meaning) of models to present the best way to convey meaning clearly and completely (Bera et al., 2014). However, this can lead to problems because it is hard to exclude user domain knowledge (i.e., pragmatic factor) when a user interprets the conceptual model in a different domain. Some research has examined the processing aspects of domain knowledge, but far fewer studies have emphasized data aspects such as conceptual modeling (Vessey, 2006) and the interaction effect between syntax, semantics, and pragmatics (Bera et al., 2014; Burton-Jones et al., 2009). Even if they did, most studies were performed within familiar domains, such as the project planning domain for industry workers (Shanks et al., 2008) and the business domain for university students majoring in management information systems (MIS) (Allen and March, 2012). In such cases, it is difficult to measure the exact effect of a domain because of the lack of comparisons where the model domain is unfamiliar to the user.

This study examined research that combined these two issues: construct overload and the lack of interaction effect between syntax, semantics and pragmatics. Specifically, the motivation of this study was to answer the following research question: Does domain familiarity affect the user's performance in construct overload?

With regard to the above question, an ontologically unclear model may be adopted and used in familiar domains without any confusion in interpreting the model, because users can apply their past knowledge to resolve the overload and presume that the domain operates as they expected. For example, if a construct overload (i.e., two potential meanings are offered) model is used, users with extensive domain knowledge will overcome ambiguity simply by selecting the meaning that makes sense in that domain. However, few studies have examined the relationship between the participants' level of knowledge across topics (i.e., the degree of domain familiarity) and the effects of ontological clarity. Most existing studies on ontological clarity performed experiments in familiar domains, so it is unclear whether the conclusions regarding ontological clarity are due to the users' high domain knowledge or the model clarity itself. For a more accurate research outcome, a study must be conducted by using a conceptual model with unfamiliar domains so that domain knowledge has less influence. If a construct-overload model with unfamiliar domains is interpreted precisely, it will be difficult to argue that construct overload is a problem for conceptual modeling practices in the real world. Because research has suggested that it is difficult to apply one's domain knowledge to an unfamiliar

27 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/article/effects-of-domain-familiarity-on-conceptual-modeling-performance/182868

Related Content

Compression Schemes with Data Reordering for Ordered Data

Chun-Hee Lee and Chin-Wan Chung (2014). *Journal of Database Management* (pp. 1-28).

www.irma-international.org/article/compression-schemes-with-data-reordering-for-ordered-data/109930

INDUSTRY AND PRACTICE: A Challenge to Database Researchers

Hasan Pirkul (1995). *Journal of Database Management* (pp. 33-33).

www.irma-international.org/article/industry-practice-challenge-database-researchers/51149

Design and Implementation of a Three-Step Intensional Query Processing Scheme

Il-Yeol Song and Hyoung-Joo Kim (1991). *Journal of Database Administration* (pp. 23-36).

www.irma-international.org/article/design-implementation-three-step-intensional/51088

Integrating Web Data and Geographic Knowledge into Spatial Databases

Alberto H.F. Laender, Karla A.V. Borges, Joyce C.P. Carvalho, Claudia B. Medeiros, Altigran S. de Silva and Clodoveu A. Davis Jr. (2005). *Spatial Databases: Technologies, Techniques and Trends* (pp. 23-48).

www.irma-international.org/chapter/integrating-web-data-geographic-knowledge/29658

Technology versus Methodology Support for Database Design: A Study of Designer Choice Related to Perception and Performance

Thomas E. Marshall and Michael L. Gibson (1996). *Journal of Database Management* (pp. 3-13).

www.irma-international.org/article/technology-versus-methodology-support-database/51168