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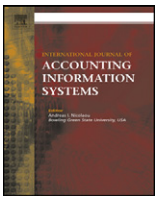

How AIS can progress along with ontology research in IS

Jian Guan [a,1], Alan S. Levitan [b], John R. Kuhn Jr. [c,*]

[a] Computer Information Systems, College of Business, University of Louisville, Louisville, KY 40292, United States
[b] School of Accountancy, College of Business, University of Louisville, United States
[c] School of Accountancy, University of South Florida, United States

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ABSTRACT

Recent years have witnessed a strong and growing interest in the computer science (CS) and information systems (IS) disciplines in applying and extending ontological principles to various CS/IS domains such as knowledge representation, natural language processing, conceptual modeling, and IS development. Similar interest and work have also been observed in accounting information systems (AIS) research. Though ontology research in AIS has enjoyed sustained interest and produced some significant results, there is relatively little incorporation of recent developments in CS/IS ontology research into AIS. This paper provides an overview of some leading areas of ontology research in CS/IS and AIS in an attempt to bridge this gap. The main objectives of this paper are to (1) introduce CS/IS ontology research, (2) highlight areas of future research in AIS where CS/IS ontology research developments can be used to address important and pressing issues, and (3) broaden an area of research where AIS can make unique contributions to distinguish itself.
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1. Introduction

In spite of advances in our understanding of the theories and practices of IS, ineffective design and development continue. In recent years, CS/IS researchers have turned to ontological principles and theories in philosophical ontology in an effort to better inform IS design and development. In philosophy the term ontology refers to the study of existence in general. The targets for philosophical ontology are the things themselves and the relationships existing among them. Ontology research in the CS/IS context is concerned with the study of a specific domain to tackle more practical issues but CS/IS ontology research employs a similar approach (as that in philosophical ontology research) and relies on theories from philosophical ontology. For example conceptual modeling and the resulting conceptual models are critical to the entire IS design and development process. The

* Corresponding author. Tel.: +1 813 974 6562.
E-mail addresses: jeff.guan@louisville.edu (J. Guan), jrkuhn@poly.usf.edu (J.R. Kuhn).
[1] Tel.: +1 502 852 7154.

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importance attached to conceptual modeling has given rise to a variety of modeling grammars and methods, but they are often based on idiosyncratic intuitions and experiences of developers (Wussusek, 2006). Recent work on establishing theoretical foundations for conceptual modeling in IS using ontological theories has led to a better understanding of conceptual modeling grammars and promises to improve both modeling grammars and conceptual models. Ontology research in CS/IS has led to a more principled approach to analysis and improvement of conceptual modeling tools and practice. Similarly philosophical ontology has inspired CS/IS researchers to define and formally represent the description of specific domains. The resulting formal descriptions, often referred to as domain ontologies, capture the domain invariants and allow different ISs in the same domain to share the common domain knowledge to ensure consistency in applications and enable true interoperability. If two enterprises are building ISs from the same domain ontology, both will be starting from the same concept of what constitutes a transaction and its attributes. (They will not be "talking past each other," as often happens in failed international diplomacy.) It follows that their ISs will therefore be more compatible, facilitating trade between them with mutual economic benefits. Further, more widespread agreement to common conceptualizations enhances inter-company comparisons for analysts, investors, and lenders, and holds promise of reduced attestation cost through reusable, more interoperable modules.

Consequently, ontology research has flourished in CS and IS and has led to significant progress in areas such as knowledge representation, conceptual modeling and IS development (Chandrasekaran et al., 1999; Wand and Weber, 2002; Kishore et al., 2004; Fonseca, 2007). Similar though less extensive research interest and work have also been observed in AIS research. The most prominent stream of such research is in the area of enterprise modeling (McCarthy, 1982; McCarthy and Geerts, 2000; Geerts and McCarthy, 2002b; Lampe, 2002; Gailly et al., 2008; Geerts, 2008). Another area of AIS research that is witnessing a growing influence of ontology is financial reporting and financial knowledge management (Declerck and Krieger, 2006; Lara et al., 2006; Spies, 2010). Though ontology research in AIS has enjoyed sustained interest and produced meaningful results, there is relatively little incorporation of recent developments in CS/IS ontology research into AIS. A main objective of this paper is to provide an overview of some leading areas of ontology research in CS/IS and AIS. Bridging this gap between CS/IS ontology research and AIS ontology research could accelerate such research in AIS.

The work in this paper also represents an effort to demonstrate the importance of integrating IS and AIS research (Dilla et al., 2010; Kelton et al., 2010; Wilkin and Chenhall, 2010). Such efforts are consistent with the calls in the AIS community for a more clearly defined research direction, identity, and focus (Sutton and Arnold, 2002; Sutton, 2004; Alles et al., 2008). While AIS is a sub-discipline of accounting, it is also increasingly part of IS (Sutton and Arnold, 2002). In this regard, the paper makes a potential contribution in three important areas. First, ontology research in CS/IS and AIS clearly falls into the realm of design science research, recognized as a dominant focus in AIS research (Sutton and Arnold, 2002). Second, the AIS research community is in a position to integrate research in IS, AIS, and accounting (Alles, et al., 2008). This paper identifies several important and promising areas for integration to move AIS research in the direction identified by researchers in AIS. Finally, the AIS research community recognizes "only limited effort has been put into developing theory within an AIS context that can advance the field and/or our sister disciplines in information systems and accounting" (Sutton, 2004). This paper highlights several areas of research where advances in our understanding of more fundamental issues in IS and AIS research can be improved. According to Gregor (2006), there are five types of theories in IS research: analysis, explanation, prediction, explanation and prediction, and design and action. Ontology research may lead to theoretical contributions in all five areas, but particularly in analysis, explanation, and design and action, areas which would all benefit from a common vision of reality's fundamental building materials.

Several very promising and exciting areas of AIS research are identified, areas such as enterprise ontology, financial reporting, and the application of domain ontologies in other areas of accounting/AIS research. Incorporating recent IS ontological theories will not only enhance and expand AIS research but also allow AIS researchers to contribute to this very important and growing area of research.

The paper is organized as follows. The next section provides an overview of some leading areas of ontology research in CS and IS. It highlights representative CS/IS ontology research work in the areas of theoretical foundations for IS design and modeling and representation of domain knowledge. The third section moves in to the ontology research in the accounting domain. It not only describes existing research but also offers suggestions for additional research and examines ways of integrating the work in CS/IS and AIS. The final section summarizes the discussion and provides concluding comments.

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