

12-14-2020

Theory Research Exchange: A Causal Model Approach to Literature Reviewing

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Recommended Citation

Song, Yuanyuan; Watson, Richard T.; Zhao, Xia; and Kelley, Nathaniel, "Theory Research Exchange: A Causal Model Approach to Literature Reviewing" (2020). *ICIS 2020*. 3.
https://aisel.aisnet.org/treos_icis2020/3

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Theory Research Exchange: A Causal Model Approach to Literature Reviewing

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Scientific advancement requires researchers to synthesize existing knowledge. The common practice is for scholars to find papers with keywords and read all possibly related ones and then manually synthesize the knowledge (Webster & Watson, 2002). The cognitively challenging task of synthesis is manual and lacks a transparent reproducible process.

To address the preceding issues, we propose to organize and structure knowledge as graphs and code them in an open graph description language. Compared to text (i.e., the current approach of organizing knowledge), graphs have an inherent nature of simplicity, consisting of only two main objects: nodes and edges. Such conciseness makes graphs easy to be standardized, which reduces the level of ambiguity. Our approach focuses on coding causal and process models in publications as directed graphs. Causal inferences are the core of knowledge and the foundation of scientific thinking and reasoning (Pearl & Mackenzie, 2018). Research questions that motivate most studies in the IS field are causal in nature.

Coding knowledge as graphs brings new approaches for knowledge extraction, knowledge synthesis, and knowledge network analytics.

Knowledge Extraction

Using Cypher queries, the database will facilitate researchers to quickly discover, for example, various definitions for concept X, various theories for explaining concept X, and articles that examine the relationship between concepts X and Y.

Knowledge Synthesis

Network science measures can be applied to assist knowledge synthesis by extracting representative graphs. For example, nodes with high in-degree centrality are likely to be well-studied outcome elements.

Knowledge Network Analytics

We intend to identify (approximate) isomorphic research models in the knowledge network, specifically, to measure the similarity of research models and identify models that are close. Isomorphism analyses graphs' topological structure, which represents the flow of causal inferences. Natural language processing decides whether two graphs are identical or the degree of similarity.

Coding publications by a third party is not an efficient long-term solution. Our team has developed software to simplify coding processes. Scholars only need to input required information such as publication citation and the software will generate the Cypher code. We encourage the IS community to adopt this method and build the knowledge network together.

References

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