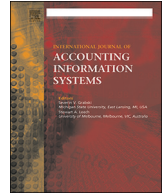




Contents lists available at ScienceDirect

International Journal of Accounting Information Systems

journal homepage: www.elsevier.com/locate/accinf

The topical link model-integrating topic-centric information in XBRL-formatted reports

Chi-Chun Chou^a, Nen-Chen Richard Hwang^b, Tawei Wang^{c,*}, Roger Debreceeny^d^a California State University, Monterey Bay, Seaside, CA 93955, United States^b California State University, San Marcos, San Marcos, CA 92096-0001, United States^c DePaul University, Chicago, IL 60604, United States^d Shidler College of Business, University of Hawai'i at Mānoa, Honolulu, IL 96822, United States

ARTICLE INFO

Keywords:

eXtensible Business Reporting Language
XLink
Link analysis
Topic Maps
Information integration

ABSTRACT

This paper proposes the Topical Link Model (TLM), which can be used as a framework to integrate information of a specific decision topic in financial reports formatted in the eXtensible Business Reporting Language (XBRL). Building on link analysis and Topic Maps concepts, this study demonstrates that the TLM allows users and preparers of XBRL-formatted financial reports to operationalize the Generic Linkbase, an existing XLink semantic tool embedded in XBRL, to integrate topic-centric information. To validate the merits of integrating information in financial reports based on TLM, this study implements a preliminary evaluation exercise that integrates quantitative and qualitative information in XBRL-formatted financial reports. The results from the exercise demonstrates that XLink, as a semantic tool, can have broader applications because it provides detailed and insightful “links” among elements in financial reports.

1. Introduction

Over the past two decades, the complexity and length of corporate annual reports have increased significantly. Cazier and Pfeiffer (2016) show that the mean (median) number of words in annual reports (Form 10-K) filed with the Securities and Exchange Commission (SEC) increases from 44 k (38 k) in 2003 to 64 k (62 k) in 2012. The primary reason for this increase is the expanded disclosure requirements stipulated in accounting standards and required by securities regulators. For instance, in recent years, the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) have augmented the number of disclosures in key areas such as going concern, leases, financial instruments, and subsequent events. Moreover, the SEC's staff accounting bulletins (SABs) require registrants to provide additional qualitative disclosures in financial reports, including misstatements (SAB 108) and revenue recognition (SAB 104).

These additional disclosures have been shown to be informative to market participants for decision-making purposes (e.g., Previts et al., 1994; Abrahamson and Amir, 1996; Antweiler and Frank, 2004; Tetlock, 2007; Li, 2010; Brown and Tucker, 2011; Kravet and Muslu, 2013; Mayew et al., 2015; Merkley, 2014; Henry and Leone, 2016). Since pieces of information for the same decision topic may appear in multiple sections of the financial report, it can be challenging to integrate such information for decision making purpose. For instance, when a financial report user is searching for a company's Accounts Receivable related information, he/she needs to search financial statements and identify corresponding footnotes and disclosures to develop a holistic understanding on the topic. This process not only is time-consuming but also relies heavily on the user's domain knowledge in order to extract and integrate

* Corresponding author.

E-mail addresses: cchou@csusb.edu (C.-C. Chou), hwang@csusm.edu (N.-C.R. Hwang), david.wang@depaul.edu (T. Wang), rogersd@hawaii.edu (R. Debreceeny).

appropriate information.

To address this issue, the eXtensible Business Reporting Language (XBRL), mandated by the SEC (SEC, 2009), is the first attempt to link financial report elements through the design of a taxonomy. However, well-recognized semantic tools, such as XLink and XBRL Linkbases, used in most XBRL projects do not provide specific links in a precise manner for all knowledge concepts under the same “topic.” A decision topic may pertain, for example, to accounts receivable, bad debt expense, allowance for bad debts, and all related disclosures. Therefore, the usefulness of these semantic tools for topical integration for decision making is somewhat limited. To address this concern, this study offers a technical solution for the integration of information under the same decision topic in XBRL-formatted financial reports. This solution allows firms' stakeholders to discern the relationships among elements in financial reports.

This study proposes the Topical Link Model (TLM) that follows the design science guidelines in studies authored by Hevner et al. (2004), Geerts (2011), and Gregor and Hevner (2013). Specifically, we first identify issues in current XBRL-formatted reports and discuss the merits of the TLM according to prior studies to highlight the objective of this study. In our view, this model allows filers, echoing users' information needs, to link a piece of information to all possible corresponding information elements in financial reports. That is, the TLM links all pieces of information related to the same decision purpose. Then, we design and develop the TLM. Moreover, we present a demonstration and preliminary evaluation of the model. To explain how the model works, we take a step-by-step approach to illustrate the implementation of the TLM.

The TLM is a semantic-centric modified XBRL model built on two existing semantic linking frameworks, viz., link analysis and XML Topic Maps.¹ As detailed in later sections, we first identify the “topics.” Since topical elements represent a collection of information intended to serve the same purpose, we then establish “associations,” which are the relationships between topics, among elements according to the pre-defined topical maps. Specifically, we build an “association” between pieces of information under the same “topic” in financial reports. Upon completion of these tasks, we develop two additional concepts for “topic,” viz “hub” and “bridge,” as well as three additional concepts for “association”: “additional-topic,” “explanatory-topic,” and “supporting-topic.” All these build on link concepts derived from link analysis.

According to Scott (2000) and Liu (2007), link analysis is a data analysis technique used in network theory to evaluate the relationships or connections between network nodes. The extensions to Topic Maps and link analysis allow the TLM to integrate related information. To ensure the TLM framework complies with the XBRL specification, the study proposes the application of Linkbase technology along with the XBRL specification for Generic Links. These technologies enable the establishment of collections of various types of information and create links among pieces of information in an XBRL-formatted financial report.

This study contributes to the literature on financial reporting and XBRL as it proposes a technical solution to integrate various pieces of information in XBRL-formatted financial reports using XBRL technology. According to our preliminary assessment, the adoption of the approach proposed in this study will reduce potential human errors in data collection and bring down the effort required to make decisions. Overall, the TLM model addresses the calls made by the SEC to provide more integrated and value-relevant information to stakeholders.

The remainder of the paper is as follows. Section 2 motivates TLM and describes our objective. Section 3 discusses the major building blocks of TLM. Section 4 elaborates the details of the proposed framework. Section 5 demonstrates how to operationalize this model with a brief example. Section 6 presents the preliminary results of the evaluation exercise, and Section 7 provides conclusions and discussion.

2. Objective of TLM

As discussed above, it is challenging to use different pieces of information in XBRL-formatted reports because decision-relevant links to related tags throughout the report are not readily available. Therefore, financial report users must depend heavily on domain knowledge to make judgments or rely on sophisticated technical and analytic skills to analyze information. Without proper integration mechanisms, users would continue experiencing difficulties to connect pieces of information which exists in various sections of financial reports. Referring to the extant literature, the main focus of prior studies on the integration of information in financial reports is to integrate qualitative information. For instance, Plumlee (2003), Campbell and Slack (2008), Engelberg (2009), KPMG (2011), and Kravet and Muslu (2013) point out that the trend toward increasing qualitative disclosures in financial reports has raised serious concerns over the usefulness of such disclosures, the information overload they cause, and the cost of processing the qualitative information.

Several studies have investigated whether qualitative disclosures in financial reports are value-relevant. For instance, Liedtka (1999) examines firms in the airline industry and shows that the disclosure of customer satisfaction ratings is value relevant. Vincent (1999) finds that FFO (a voluntarily disclosed performance measure for REITs) and EPS provide incremental information content. More recently, Wang et al. (2013) demonstrate that qualitative disclosure of information security risk factors may dampen the negative impact of subsequent security incidents. Also, several researchers find that the qualitative disclosures in the management discussion and analysis (MD&A) are useful in predicting changes in firm financial performance (e.g., Bryan, 1997; Cole and Jones, 2004; Sun, 2010). As an example, Sun (2010) shows that the favorable explanations to inventory changes stated in the MD&A positively associate with a firm's profitability and sales growth. This empirical result supports the notion that qualitative disclosure of inventory information in the MD&A may assist users of financial reports in interpreting unexpected inventory changes.

While qualitative disclosures are value relevant (e.g., Amir and Lev, 1996; Ittner and Larcker, 1998; Liedtka, 1999), their usage is

¹ See Appendix A for a glossary of terms.

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