Teaching and educational notes

The need for 'skeptical' accountants in the era of Big Data

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ABSTRACT

Big Data is now readily available for analysis, and analysts trained to conduct effective analysis in this area are in high demand. However, there is a dearth of discussion in the literature related to identifying the important cognitive skills required for accountants to conduct effective Big Data analysis. Here we argue that accountants need to approach Big Data analysis as informed skeptics, being ever ready to challenge the analysis by asking good questions in appropriate topical areas. These areas include understanding the limits of measurement and representation, the subjectiveness of insight, the challenges of statistics and integrating data sets, and the effects of underdetermination and inductive reasoning. Accordingly, we develop a framework and an illustrative example to facilitate the training of accounting students to become informed skeptics in the era of Big Data by explaining the conceptual relevance of each of the topical areas to Big Data analysis. In addition, example questions are identified that accountants conducting Big Data analysis should be asking regarding each topic. Further, for each topic, references to additional resources are provided that students can access to learn more about effectively conducting Big Data analysis.

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1. Introduction

Big Data is characterized by three attributes: velocity, variety and volume (Laney, 2001), and results from two trends: plummeting cost of storage, and innovative means to analyze and interpret data. These trends have led to exponentially increasing amounts of data, as every 48 h, as much data is created as was from the dawn of civilization to 2003 (Siegler, 2010). As a result, Big Data is changing business (McAfee, Brynjolfsson, Davenport, Patil, & Barton, 2012) as well as ushering in a new era for global commerce (Shah, Horne, & Capellá, 2012). That said, the changes needed to accounting education to better prepare students to effectively utilize Big Data are just beginning to emerge. This paper seeks to help students understand the need to approach Big Data analyses with the mindset of a 'skeptical' accountant.

This paper's motivation stems from the growing availability of Big Data and how this is shifting professionals' expectations of the students they hire. Not only are Big Data skills such as database analyses, visualization creation, and tool selection required, graduates are increasingly expected to be able to apply higher order thinking skills to related analyses. Shah et al. (2012) called these Big Data higher order skills Big Judgment. We suggest a key aspect of this Big Judgment is the ability to adopt an attitude of skepticism by recognizing the need to ask good questions throughout the analyses. To this end, we identify and classify a preliminary set of seven topical areas, and related questions, into a framework suitable for accounting

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educational purposes. These topics are technology independent and emerge from a deeper awareness of the assumptions that support Big Data analyses. We expect this list to grow and become more refined in coming years. We incorporated the topics in our senior level/masters level courses on Big Data—courses outside of the traditional accounting curriculum. Employers persuaded us to include them as they found many new hires were naïve about important assumptions on which analysis rests; these new hires, aptly labeled unquestioning empiricists, put too much trust in analysis over judgment (Shah et al., 2012). As a result, we added these questioning topics to the existing subjects of technology and statistics within our business intelligence courses.

The paper is organized as follows. We first outline the broad impact of Big Data on accounting and education and then explain why accounting education needs to produce informed skeptics for this era of Big Data. The learning outcomes and criteria for our topics are presented next, followed by a presentation of the seven topics. Then, an illustrative example is presented and referred to throughout the discussion of the seven topics. Conclusions and limitations of the paper follow.

2. Big Data, business and accounting

The broad impacts of Big Data on the business environment are technical, managerial and social in nature. They include how technologies should be selected, how to reasonably limit the scope of an analysis, how to examine the tradeoff of privacy and security, how to address cultural biases in analyses, and how to address the challenges of privilege and digital divides (Boyd & Crawford, 2011; Chan & Kogan, 2016). Other issues include ownership of data, and compliance and security (Gantz & Reinsel, 2012; Kaisler, Mondy, & Coen, 2012). Ritchey (2005) highlights the Big Data management challenge of structuring socially messy problems that come with incomplete, contradictory and changing requirements. More specific to accounting, Big Data fundamentally changes how accounting data are understood and reported (Griffin & Wright, 2015). Warren, Moffitt, and Byrnes (2015) claim that Big Data gives firms new opportunities to identify behaviors correlated with goal outcomes and the ability to formulate, store and analyze new performance measures. They also suggest Big Data will give firms new opportunities to use external data such as social media sentiment in forecasts. McKinney, Yoos, Green, and Heppard (submitted for publication) suggest Big Data will create a new consumer driven demand for accounting data that is atomized, reconfigurable and transparent. A noteworthy concern is the current slow pace of accounting in making adjustments to meet this new demand (Griffin & Wright, 2015).

These impacts on the business and accounting environment are changing business education (Coyne, Coyne, & Walker, 2016). Most of the suggested changes to educational objectives involve analytical and IT skills, including how to design queries and data structures, how to prepare data for analysis, how to use statistical and other analytical tools, and how to create and share visualizations (Chen, Chiang, & Storey, 2012; Kaisler, Armour, Espinosa, & Money, 2013). Further, Lazer, Kennedy, King, and Vespignani (2014) highlights the need for business students to understand construct validity, scaling limitations, and reliability and dependencies among data. As noted, Shah et al. (2012) believe business education should produce students who can also exercise the Big Judgment necessary to appropriately analyze Big Data. In their view, a decision maker with Big Judgment skills possesses a healthy and informed skepticism that can assess the factors underpinning the numbers and think critically about the assumptions behind the data. While these informed skeptics have been shown to improve a wide range of metrics across a variety of business functions, they are relatively few in number; helping more students become informed skeptics should not be left to broad educational changes or to technology courses (Shah et al., 2012). We agree—accounting education also has a role to play in training students to become informed skeptics. While there have been many calls for modifications in accounting education over the past 30 years in response to changes in the financial environment and technology (AAA, 1986; AECC, 1990; Albrecht & Sack, 2000), the presence of Big Data will likely require more significant changes than ever before, as we can expect an increase in both analytical skills and database skills being added to accounting curriculum. Finally, not only is Big Data changing *how* accounting education will be performed, it will also have an impact on *who* will analyze the data, given one of the characteristics of Big Data tools is self-service (Gantz & Reinsel, 2012; Lycett, 2013). Krahel and Titera (2015) believe that Big Data will result in more analyses being done by accountants rather than data analysts; however, Yoon, Hoogduin, and Zhang (2015) suggest that there will not be enough trained accounting analysts to audit all the available data.

3. The importance of asking good questions in the era of Big Data

Given the emphasis on data analytics, we suggest accounting education should train students to ask good questions. This training of higher order thinking skills is consistent with a number of recent directives by accounting education agencies such as the Accounting Education Task Force, the Pathways Commission, and the Association for the Advancement of Collegiate Schools of Business (AACSB). Two findings of the Accounting Education Task Force report (Lawson et al., 2015) are particularly germane to our proposal. First, the task force calls for accounting education to better prepare students for long-term career demands and reduce emphasis on first job skills. Second, accounting education objectives should reflect how accountants add organizational value. We believe the ability to ask good questions is a long-term career skill particularly useful to organizational value. Accounting graduates that can ask good questions can improve the quality of their collaboration and the value of analyses, and hence, long-term value.