The Use of Data Analytics in Internal Audit to Improve Decision-Making: An Investigation of Data Visualizations and Data Sources

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Executive Summary

Internal auditors evaluate and improve the effectiveness of governance, risk management, and control processes by conducting a variety of projects to provide assurance and insights to various parties including managers (Anderson and Christ 2014; IIA 2018). Recommendations to managers include how to mitigate risk and improve business processes (IIA 2018). Managers then choose whether to accept an internal auditor's recommendation. As internal auditors seek agreement from managers, it is important to understand factors that influence managers' agreement with an internal auditor's recommendation.

Internal auditors can use various information sources to support their recommendations. Of interest today is the analysis of increasingly available large internal and externally sourced data sets. Internal auditors can use data analytics on a variety of data sources, including both financial and non-financial data, to make recommendations that create insights for managers.[1] This is particularly relevant as current technology provides internal auditors with access to more Big Data sources, and many of these sources are non-financial. Additionally, internal auditors also potentially have easier access to their organization's data than external auditors while also having a greater opportunity to use Big Data, as their scope of work is more extensive than financial statement auditors (Alles and Gray 2016). This positions internal auditors to use data analytics with multiple data sources to improve decision-making in their organizations. However, sources can conflict in their support for a recommendation. For example, customer sentiment

[1] Data analytics is "the process of gathering and examining data with the intention to use the results to facilitate an improved decision-making process" (Stippich and Preber 2016, 1).

from websites (non-financial data) can support an internal auditor's recommendation while inventory trends (financial data) may not support the recommendation. This is particularly important as prior research demonstrates a bias against some types of financial data (Cardinaels and van Veen-Dirks 2010; Brazel et al. 2014).

Many visualizations (e.g., bar graphs or geographic maps) are available to communicate recommendations to managers and are particularly relevant for communicating Big Data sources. However, visualizations differ in their evaluability, the ease with which information is assessed and compared (Hsee 1996; Lurie and Mason 2007). This suggests the importance of selecting an appropriate visualization to make sure that managers appropriately evaluate data.

As organizations capture newer Big Data sources in information systems, experimental research is needed to understand how Big Data sources and the related presentation influence judgments (Moffitt et al. 2016). Given this and the previous discussion, I examine how managers' judgments from an internal auditor's recommendations are influenced by some aspects of newer Big Data sources and the related visualizations. Specifically, I examine how managers' judgments an internal auditor's recommendation are influenced by the
(1) supportiveness of non-financial data with the internal auditor's recommendation and
(2) evaluability of visual representations for non-financial data.

I first seek to answer whether managers integrate newer non-financial data sources into their agreement with an internal auditor's recommendation. Specifically, I examine whether managers are more likely to agree with an internal auditor's recommendation when non-financial data supports an internal auditor's recommendation compared to when the data does not support the recommendation in a setting where financial data does not support the recommendation. Second, I seek to understand whether the evaluability of visual representations for non-financial

data alters the strength of the relationship between the supportiveness of non-financial data with the internal auditor's recommendation and managers' agreement with the recommendation. Third, I examine why these relationships occur by considering managers' confidence in the internal auditor's recommendation.

To test my expectations, I conduct an experiment with an inventory write-down task (Fanning and Piercey 2014). This task requires making a prediction and both financial and newer non-financial Big Data sources are relevant for this judgment. Participants assume the role of a manager who receives a recommendation from an internal auditor to write-down inventory and are asked their likelihood of agreeing with the internal auditor's inventory write-down recommendation. I manipulate the supportiveness of non-financial data, which either supports or does not support the internal auditor's recommendation. Evaluability of visual representations for non-financial data is operationalized as the: (1) proximity of financial and non-financial graphs, which are either together (easier) or separate (more difficult), and (2) type of non-financial graph, which is either a grouped bar graph chart (easier) or a stacked bar chart (more difficult).

I find that managers' agreement with an internal auditor's recommendation increases when non-financial data supports the recommendation compared to when the data does not support the recommendation. However, this effect depends on the evaluability of visual representations for non-financial data. When evaluability of visual representations for non-financial data is easier, this effect remains. This shows that managers integrate newer supportive non-financial data sources into their agreement with an internal auditor's recommendation, even when financial data does not support the recommendation. However, when evaluability of visual representations for non-financial data is more difficult, the effect does not remain. This suggests reduced judgment quality of managers' agreement when evaluability is more difficult. I also find

that confidence in the internal auditor's recommendation acts as a mediating mechanism to explain why managers' agreement is influenced by the supportiveness of non-financial data and the evaluability of visual representations for non-financial data in some situations.

This dissertation contributes to academic literature. First, I answer calls for research examining how newer Big Data sources and their related presentation influence judgments (Alles and Gray 2016; Moffitt et al. 2016) by finding evidence that one newer type of non-financial data is integrated into managers' judgments in certain situations, while the evaluability of the related presentation also influences the quality of managers' judgments. Second, I expand on the literature stream that examines managers' agreement with recommendations from internal auditors (Burton et al. 2012; Fanning and Piercey 2014; Tang et al. 2017; Carcello et al. 2018; Brown and Fanning 2019) by providing evidence of how managers' agreement with recommendations is influenced interactively by aspects of data sources and the related visualizations in a relevant setting of using newer Big Data sources, which has high complexity to convey knowledge. I also extend this literature by finding that confidence in the internal auditor's recommendation is a mediating variable in some relationships.

This study also contributes to the internal auditing profession. Data analytics and the use of newer Big Data sources are expected to increase in the future (Deloitte 2016; Protiviti 2017, 2018). While data analytics includes several steps, the communication of complex data sets is an important step. I provide initial evidence that internal auditors should use visualizations that have easy evaluability for the task to ensure that managers agree with recommendations when the data appropriately supports the recommendation. This is particularly important as there are many graphs and visuals available, yet the evaluability of the specific visualization is important for a graph to be effective for a specific task. Findings can be used to train internal auditors.

References

Alles, M., and G. L. Gray. 2016. Incorporating big data in audits: Identifying inhibitors and a research agenda to address those inhibitors. *International Journal of Accounting Information Systems* 22: 44-59.

Anderson, U., and M. Christ. 2014. Internal audit. In *The Routledge Companion to Auditing*, edited by Hay, D., W. R. Knechel, and M. Willekens, 230-239. Abingdon, U.K.: Routledge.

Brazel, J. F., K. L. Jones, and D. F. Prawitt. 2014. Auditors' reactions to inconsistencies between financial and nonfinancial measures: The interactive effects of fraud risk assessment and a decision prompt. *Behavioral Research in Accounting* 26 (1): 131-156.

Brown, T., and K. Fanning. 2019. The joint effects of internal auditors' approach and persuasion tactics on managers' responses to internal audit advice. *The Accounting Review* (forthcoming).

Burton, F. G., S. A. Emett, C. A. Simon, and D. A. Wood. 2012. Corporate managers' reliance on internal auditor recommendations. *Auditing: A Journal of Practice & Theory* 31 (2): 151-166.

Carcello, J. V., M. Eulerich, A. Masli, and D. A. Wood. 2018. The value to management of using the internal audit function as a management training ground. *Accounting Horizons* 32 (2): 121-140.

Cardinaels, E., and P. M. van Veen-Dirks. 2010. Financial versus non-financial information: The impact of information organization and presentation in a balanced scorecard. *Accounting, Organizations and Society* 35: 565-578.

Deloitte. 2016. *Evolution or Irrelevance? Internal Audit at a Crossroads. Deloitte's Global Chief Audit Executive Survey*. Available at: https://www2.deloitte.com/global/en/pages/audit/solutions/global-chief-audit-executivesurvey.html (last access August 29, 2017).

Fanning, K., and M. D. Piercey. 2014. Internal auditors' use of interpersonal likability, arguments, and accounting information in a corporate governance setting. *Accounting, Organizations and Society* 39: 575-589.

Hsee, C. K. 1996. The evaluability hypothesis: An explanation for preference reversals between joint and separate evaluations of alternatives. *Organizational Behavior and Human Decision Processes* 67 (3): 247-257.

Institute of Internal Auditors (IIA). 2018. *Internal Auditing: Assurance, Insight, and Objectivity*. Available at: https://na.theiia.org/about-ia/PublicDocuments/PR-Value_Prop_Bro-FNLLo.pdf (last access on February 28, 2018).

Lurie, N. H., and C. H. Mason. 2007. Visual representation: Implications for decision making. *Journal of Marketing* 71 (1): 160-177.

Moffitt, K. C., V. J. Richardson, N. M. Snow, M. M. Weisner, and D. A. Wood. 2016. Perspectives on past and future AIS research as the Journal of Information Systems turns thirty. *Journal of Information Systems* 30 (3): 157-171.

Protiviti. 2017. *Embracing Analytics in Auditing.* Available at: https://www.protiviti.com/sites/default/files/united_states/insights/2017-internalauditcapabilities-and-needs-survey-protiviti.pdf (last accessed March 18, 2018).

Protiviti. 2018. *Analytics in Auditing Is a Game Changer*. Available at: http://www.protiviti.com/sites/default/files/2018-internal-audit-capabilities-and-needssurvey- protiviti.pdf (last accessed May 27, 2019).

Stippich, W. W., and B. J. Preber. 2016. *Data Analytics: Elevating Internal Audit's Value.* Altamonte Springs, FL: The Institute of Internal Auditors Research Foundation (IIARF).

Tang, F., L. Yang, and H. Gan. 2017. Internal auditors' reputation and managers' reliance decision. *Managerial Auditing Journal* 32 (8): 768-787.