The Rutgers CarLab is pleased to provide comments on the IAASB Data Analytics Working Group Consultation Paper, *Exploring the Growing Use of Technology in the Audit, with a Focus on Data Analytics*

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SUMMARY:
On September 2016 the IAASB's Data Analytics Working Group (hereafter, the Group) issued a Consultation Paper requesting input and perspectives on whether all considerations relevant to the use of data analytics in the audit have been identified. The Group requested input from various stakeholders such as accounting firms, standard setters, audit regulators and oversight authorities. The comment period ended February 15, 2017. This commentary summarizes the views of the Rutger's Continuous Audit and Reporting Laboratory (hereafter, CarLab) members on the questions presented in the Consultation Paper.

Data Availability: The request for stakeholder input (by February 15, 2017) and Consultation Paper is available at: https://www.iaasb.org/publications-resources

RESPONSE:
February 15, 2017
Dear IAASB Staff:

The CarLab is pleased to provide comments on the Data Analytics Working Group Consultation Paper, *Exploring the Growing Use of Technology in the Audit, with a Focus on Data Analytics.*

The views presented in this commentary are those of the participating members and do not reflect an official position of Rutgers, The State University of New Jersey. Moreover, the comments reflect the consensus of the CarLab members, not necessarily the views of every individual member.

We hope that our comments and suggestions are helpful. If you have any questions or concerns concerning our input, please feel free to contact us for any clarification.

Sincerely,

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INTRODUCTION

Recent advances in technology and the proliferation of large volumes of data have resulted in business models that are more complex. In the current business environment stakeholders are likely to expect auditors to perform financial statement audits that require the use of new technologies and data analytics. The purpose of the Consultation Paper is to inform stakeholders about the IAASB's ongoing initiative to explore the use of technology, with a focus on data analytics, and to collect insights from accounting firms, standard setters, audit regulators, oversight authorities, and others (e.g. academics) to assist the Group in its initiative. On the Consultation Paper, the Group emphasizes the challenges posed by environmental factors and circumstances in the business environment as well as the standard-setting challenges encountered by auditors.

The Group's initiative to explore the use of technology and data analytics in financial statement audits is important for several reasons. First, the ISAs do not prohibit the use of data analytics, but they were developed in a different technological era. Hence, there is a need for the ISAs to continue to be robust and relevant and reflect current practices and developments. Second, data analytics can provide sufficient and appropriate audit evidence and reduce the amount of effort spent in manual analysis. Although data analytics have the potential to optimize efficiency and effectiveness and thus, improve audit quality, a prevalent issue that remains is the validation, accuracy, and completeness of internal and external data. Finally, as auditors and oversight authorities explore the use of data analytics in the audit, a robust framework in the ISAs is necessary to provide a basis to support judgments and procedures performed in the audit. The Group believes there may be opportunities for the ISAs to be revised based on the considerations outlined in the Consultation Paper, however, further development and analysis (such as academic research) is necessary to address the use of technology and data analytics in the audit.

COMMENTS

Our commentary first discusses some of the specific questions presented in the Consultation Paper. Specifically, we focus on the areas of audit evidence, audit quality, data integrity and security, and standard-setting challenges. We further provide additional considerations related to the application of data analytics in the audit. Our views are primarily based on our knowledge of current practice, existing data analytics methodologies, and related literature.

Response to Specific Questions

Question a*: Have we considered all circumstances and factors that exist in the current business environment that impact the use of data analytics in a financial statement audit?*

In the Consultation Paper, page 11, the Group references several challenges posed by environmental factors and circumstances in the business environment that may have an impact on the use of data analytics in a financial statement audit. We endeavor to provide additional insight into this area. One consideration when exploring the use of data analytics on audit engagements should be the emerging structure of audit engagements. The Group expresses, in point (d), that auditors may require skilled centralized resources, such as data scientists, to support engagement teams. While anecdotal evidence suggests audit teams currently utilize centralized support teams to assist in the development or employment of data analytics on an ad-hoc basis, we concur with the Group's view that as the use of data analytics increases, these resources may be limited in their availability to support engagement teams. Therefore, as the reliance of centralized support teams increases, accounting firms will need to consider hiring more data scientists ("specialists") to meet the demand. Essentially, the "new" audit engagement model will entail the continuous collaboration of audit staff (i.e. first year, second year, senior associate, manager and partner) and data specialists for auditors to harmoniously transition to the era of data analytics.

While it is essential that the audit engagement team be expanded to include specialists, audit firms must continue to train auditors to exhibit enhanced critical thinking skills and professional skepticism, particularly when evaluating the results of audit data analytic procedures. Because of the complexities associated with the use of audit data analytics, auditors face increased processing demands. Thus, an increased emphasis on critical thinking skills and professional skepticism is of major importance because audit research suggests that auditors may over rely on the work of specialist without carefully considering the specific aspects of underlying work performed by the specialist (PCAOB 2008, 2015; Griffith, Hammersley, and Kadous 2015). Essentially, auditors may not appropriately weight the views of outside specialists and might be overconfident in their ability to assess risks in an environment that is more complex and where auditors may not be as knowledgeable as the specialists (e.g., Brazel, Agoglia and Hatfield 2004).

As the audit profession reinvents itself, it is also fundamental for regulators and oversight authorities to keep up to date with recent developments and the application of data analytics in a financial statement audit. The Group presents in point (e) that audit oversight authorities may have little experience inspecting data-driven audits. It is expected for not only auditors, but audit oversight authorities, and regulators to be well prepared to audit and inspect audit engagements that use data analytics. The application of innovative technologies on an audit engagement may require a change in how these parties evaluate audit evidence in the new "data-driven" audit process.

On page 13 of the Consultation paper, the Group raises several questions concerning the potential impact of audit analytics on audit evidence. Traditional audit evidence is generally archival and internal, whereas, the evidence normally extracted from the external environment is more probabilistic in nature and must be considered with the characteristics of information (Brown-Liburd and Vasarhelyi 2015). Specifically, regulators will need to evaluate whether audit evidence generated using audit data analytics meets the criteria of sufficient appropriate evidence. Thus, one question to consider is whether the use of audit data analytics automatically addresses the sufficiency and appropriateness of audit evidence. For example, auditing standards define sufficiency as the measure of the quantity of audit evidence needed based on the auditor's assessment of the risks of material misstatement (the higher the assessed risks, the more audit evidence is likely to be required). However, Brown-Liburd and Vasarhelyi (2015) note that, because audit data analytics can be utilized to analyze and test complete populations of detailed transactions and balances, the sufficiency of audit evidence may not be the primary issue. Instead, the shift in focus will most likely relate to timely accessibility of the relevant data and the various data analytic tools auditors use to analyze and interpret the data in a more meaningful and effective way.

Appropriateness is the measure of the quality of audit evidence; that is, its relevance and its reliability in providing support for the conclusions on which the auditor's opinion is based. The traditional approaches for the evaluation of relevance and reliability may not apply. While, relevance will likely continue to be determined by judgment, such judgment will be subject to evaluation by formalization, as many audit tests will be formalized into computer procedures that

do not currently exist. In contrast, reliability will likely increase because in general, automated data extraction and utilization by formal models are much more reliable than manual processes (Brown-Liburd and Vasarhelyi 2015).

A final important consideration, as noted in points (e) and (f) on page 11 of the Consultation Paper, is the re-training of audit professionals and regulators responsible for evaluating the work of auditors (e.g., PCAOB, IAASB) in a more technology driven audit environment. A key challenge that arises relating to these professionals is whether they can be trained to adopt a different mindset when evaluating evidence generated from the use of data analytics[1]. Prior audit research provides evidence that mindsets impact auditor judgment and performance (e.g., Brown and Bhattacharjee 2015; Griffith, Hammersley, Kadous, and Young 2015a; Bhaskar, Majors, and Vitalis 2016). For example, auditors in a deliberative mindset are better able to identify and integrate information contradicting management's assumptions as well as think more critically about audit evidence (Griffith et al. 2015a). Ikuta, Majors and Winn (2016) provide evidence that a judgment based standard induces greater counterfactual reasoning (i.e., critical thinking) than a more prescriptive standard. Thus, standards can play a key role in driving auditor mindsets by developing judgment based standards that guide audit procedures and prompt auditors to engage in critical evaluation. Prompting auditor mindsets will also be important at the college level. However, accounting professors may not be prepared to teach analytics and students may not be receptive to learning innovative tools (Appelbaum, Showalter, Sun, and Vasarhelyi 2015). Hence, it is expected that the re-training of audit professionals and regulators will happen in gradual stages.

***Question b**: Is our list of standard-setting challenges accurate and complete?*

The Consultation Paper, page 11, lists the challenges encountered by auditors that may affect audit standard-setting. We provide commentary on some of the listed challenges and present additional challenges that we believe should be considered.

<u>Internal Controls</u>

[1] Mindsets has been described as a series of mental processes that result in an inclination to approach a task in a particular way (Gollwitzer 1990),

On page 12, point (a), the Group discusses the importance of General IT controls in the audit. We concur with the Group that the robustness of General IT controls is critical when performing data-driven audits. General IT as well as IT Application Level controls are essential to financial statement audits that use data analytics because auditors need to place more reliance on the data produced by the accounting systems. As noted, prior research (e.g., Brazel, et al. 2004) suggests that evaluating the operating effectiveness of controls in an IT environment presents challenges for auditors because auditors do not always have a sufficient understanding of the work performed by IT auditors (PCAOB 2015). The ISAs should consider emerging methodologies that can perform the automatic validation of automated controls. Recent academic research has explored the use of process mining to evaluate the effectiveness of internal controls over financial reporting (e.g. Chiu, Vasarhelyi and Jans 2017; Van der Aalst, Hee, Werf and Verdonk 2010; Jans, Alles and Vasarhelyi 2014). For instance, Chiu et al. (2017) use process mining for segregation of duty analysis and timestamp examination. They provide evidence this methodology can be effective in the detection of potential risks and inefficient internal processes.

The Group may want to consider similar procedures to test IT controls and perhaps revise ISA 330 paragraph 10, "Nature and Extent of Tests of Controls" to suggest the use of methodologies such as process mining to test the operating effectiveness of separation of duties controls and automated controls. This is especially important given the pervasive impact that ineffective IT controls can have on the accounting information system, especially in an environment where the company may be using more advanced analytics such as continuous auditing and monitoring technology. Anecdotal evidence indicates that increasingly internal audit departments are using data analytics (Verver 2016). Therefore, external auditors should expand their understanding to the IT environment to address risks in a data analytic environment. For example, before external auditors can place any reliance on data generated by their client, they must understand how management has ensured the security, reliability and integrity of the data. We discuss these issues below.

Data Reliability and Integrity

ISAs require auditors to evaluate whether information provided for audit procedures is sufficiently reliable (ISA 500 paragraph 9). As discussed by the Group in page 12, point (b), most data used for analysis may be internally produced, and it is important to evaluate the completeness, accuracy

and reliability of such data. However, in addition to considering internally produced data, the ISAs should also consider providing guidance on how auditors may assess the level of completeness, accuracy, and reliability of exogenous Big Data (e.g. social media, RFIDs, GPS) and its provenance (Appelbaum 2016). Such concern is discussed on page 12, point (c). While, exogenous data is not subject to rigorous integrity checks, it may provide valuable insights and perhaps, audit evidence. For example, social media postings by consumers may assist in the evaluation of the client's financial condition, or client acceptance assessments.

However, the audit team would need to verify that the postings originate from authentic account owners, that they are not tampered with, and that the text mining applications are rigorously utilized. Specifically, if exogenous data are culled from press releases, conference calls, and legislation, the audit team would need to continually monitor the applications to prevent any misclassification arising from the use of inappropriate lexicons to classify tones in financial documents (Loughran and McDonald 2011). Absent this enhanced level of data verification, financial statements auditors may hesitate to base decisions on this information, particularly from a legal standpoint. If this verification requires substantial additional effort by the audit team, it is conceivable that certain types of exogenous Big Data may not improve the effectiveness and efficiency of the audit process in providing a reasonable level of assurance.

It could be plausible for certain higher risk business cycles and industries that a greater utilization of big data and its insights may prove to be beneficial to the audit team, despite the greater computational and financial costs. The Group perhaps should provide guidance regarding the industries or cycles where they envision Big Data providing the most immediate benefit, and possibly conduct a few beta case studies. Specifically, due to the wide prevalence of various human-generated data, including social media mentions, data analytics is indispensable for automated text analysis. Failure to include it in the audit procedure could spawn inaccurate results and incorrect conclusions. For instance, social media postings by consumers have the potential to provide valuable insight and audit evidence, yet the validation of such data remains a challenge. The Group may find the "Big Data as Complementary Audit Evidence" (Yoon, Hoogduin, and Zhang 2015) research study useful in evaluating the opportunities and challenges of incorporating Big Data in the audit process.

Furthermore, the Group may wish to revise the premise in the ISAs (ISA 500, paragraph A8) which states that data obtained from independent sources (third parties) may be more reliable. Data obtained from third parties may be more reliable only under the circumstances where rigorous data integrity checks are likely to be performed. Absent these integrity checks, the provenance (Appelbaum 2016) and security of the data is questionable. That is, external big data could present the lowest level of reliability to the auditor. Guidelines regarding data integrity evaluation procedures should be developed for internal and external data of all types.

Analytical Procedures

Auditors may use analytical procedures to identify and assess the risk of material misstatement (ISA 315), obtain relevant and reliable audit evidence during the audit (i.e. substantive analytical procedures) and to form overall conclusions on the financial statements near the end of the audit (ISA 520). The ISAs define analytical procedures as the analysis of plausible relationships among financial and non-financial data. In addition to traditional analytical procedures, predictive analytics could also be performed in the audit. Predictive analytics use company provided data and non-traditional data (e.g. weather, traffic patterns) to develop expectations at a disaggregated level on a continuous basis, which may lead to more accurate expectations. The Group may find the Yoon and Kogan (2015) research study on "Big Data as Audit Evidence" helpful in providing insight about the use of predictive analytics as analytical procedures.

Risk Assessments

Furthermore, as suggested by the Group, on page 13, points (d) and (e) data analytics has the potential to improve the risk assessment and risk response processes in the audit. However, current ISAs categorize risk assessment and response activities separately. It would be beneficial to audit practice for the ISAs to consider the modification of the current structure of audit procedures by recommending that predictive analytics may be used, concurrently, as risk assessment procedures, tests of controls and substantive procedures. Although analytical procedures in the risk assessment process are traditionally used to obtain an understanding of the entity and its environment, they may also be used to collect relevant and reliable audit evidence as data analytics enables the auditor to examine 100% of the population.

Moreover, predictive analytics can test the existence, completeness, and accuracy of the population. Therefore, the Group should consider whether it would be appropriate to replace, or reduce other analytical procedures when predictive analytics provide validation for management assertions. The key challenge, as mentioned above, is the validation of non-traditional external data. Lastly, in an environment where predictive analytics may be used as a dual, or even triple purpose procedure, the Group should consider whether there should be guidance on what would be an acceptable variance threshold for a predictive analytic that can be used to test controls and at the same time, perform substantive tests; or a predictive analytic that can be used to assess risks, test controls, and perform substantive analytical procedures.

Continuous Auditing Methodologies

Advancements in technology have prompted the digitalization of business processes. Business entities have shifted from a traditional business model, to a modified business model adapted to reflect the "now" economy (Vasarhelyi and Alles 2008). In a business environment where large volumes of transactions are processed in ERP systems, a sampling-based approach may become obsolete. ISA 500 paragraph A53 provides brief guidance of the circumstances when the examination of 100% of the population may be appropriate (i.e. when the population constitutes a small number of large value items). However, research studies (e.g. Alles, Brennan, Kogan and Vasarhelyi 2006; Vasarhelyi and Halper 1991), as well as anecdotal evidence, has provided evidence that Continuous Auditing (CA) methodologies enable auditors to test 100% of the population of interest and potentially improve audit efficiency. CA is a methodology that can be adapted to various types of data analytics (e.g. predictive and prescriptive). CA is not limited to small populations and can be performed on a real-time basis (daily, weekly, monthly, etc.). Academic literature in the CA domain is abundant[2] and may help inform the standard setting

[2] Examples of research studies the Group may find useful in informing the standard-setting process include:
1. "Continuous monitoring of business process controls: A pilot implementation of a continuous auditing system at Siemens."Alles, Brennan, Kogan and Vasarhelyi 2006;
2. "The continuous audit of online systems." Vasarhelyi and Halper 1991;
3. "Principles of analytic monitoring for continuous assurance." Vasarhelyi, Alles and Kogan 2004;
4. "Putting continuous auditing theory into practice: Lessons from two pilot implementations." Alles, Kogan and Vasarhelyi 2008;
5. "Innovation and practice of continuous auditing." Chan and Vasarhelyi 2011;

process. Therefore, the Group may find it helpful to review CA research to evaluate the implications of this methodology on data analytics. Furthermore, the Group perhaps should consider the revision of ISA 500 paragraph A53 and ISA 530, on Audit Sampling, to provide guidance about the circumstances under which CA can be used in the audit. For example, CA can be utilized for populations of any size and level of risk, to test internal controls, perform tests of details or substantive analytical procedures, when the benefits of doing so outweigh the costs.

Importantly, testing the complete population eliminates sampling risk. Sampling risk arises from the possibility that, when a test of controls or a substantive test is restricted to a sample, the auditors' conclusions may be different from the conclusions they would reach if the test were applied in the same way to all items in the account balance or class of transactions. The auditor will know with greater certainty the monetary misstatements or deviations from prescribed controls that exist in the balance, or class as a whole when testing the entire population of transactions or account balances. An open question is whether risk is completely reduced. For example, the auditor may fail to recognize misstatements included in documents that she examines, which would make that procedure ineffective even if she were to examine all items. Therefore, judgment and professional skepticism are aspects of auditing that are required regardless of the type of audit testing methodology. As noted earlier, standards that prompt auditors to adopt a deliberative mindset will potentially mitigate auditors failing to detect a material misstatement.

Evaluating Exceptions

On page 14, point (g) of the Consultation Paper, the issue of identifying many outliers, as a result from testing 100% of the population, is discussed. While the traditional audit approach is designed around a sample-based approach (ISA 530), we concur with the Group that testing 100% of the population may provide a more accurate estimate of the magnitude of misstatements. However, we believe it would be rather impractical and ineffective for auditors to test all the outliers detected resulting from CA procedures. Furthermore, testing a random sample from the outlier population may not be adequate. For example, if the CA methodology detects 10,000 outliers, resorting to a sample-based audit approach is likely to require at most, 60 outliers for review, which may not

6. "The acceptance and adoption of continuous auditing by internal auditors: A micro analysis" Vasarhelyi, Alles, Kuenkaikaew, Littley 2012.

represent an accurate sample of the population of outliers. It is our view that the processing of outliers can benefit from the application of risk-based filters. These filters will consist of qualitative or quantitative criteria that can facilitate the isolation of the data instances that are exceptions, and represent riskier transactions or process flows. The Group may want to refer to the "Exceptional exceptions" (Issa 2013) research study which proposes a framework to address the processing of large amounts of exceptions (outliers) that result from performing CA procedures.

The framework guides the auditor to review the more suspicious records by employing a composite score based on a set of a risk-based criteria that ranks whether a record is more or less suspicious. Moreover, one of the initiatives from the Rutgers AICPA Data Analytics Research Initiative (RADAR) seeks to design a more systematic approach for prioritizing exceptions. From a substantive analytical procedures perspective, for example, non-traditional financial metrics such as square footage, may be used as a risk-filter to identify the accuracy of revenue for real estate inventory. It would be the auditors' responsibility however, to determine the appropriate risk filters to use in the analytic as these filters may vary by industry and audit client.

Furthermore, as data analytics enables the auditor to validate certain assertions, the argument could be made that sufficient appropriate audit evidence, where no exceptions were identified, is gathered. The reliability of audit evidence obtained from data analytics can be assured through the verification of both General IT controls and Application Level controls. If the operating effectiveness of IT controls is deemed satisfactory then auditors can place reliance on the output of the ERP system and gather audit evidence from the population of non-outliers identified from the CA procedure. Overall, the ability to measure audit tests results more precisely with data analytics than with traditional audit procedures is expected to increase audit quality.

Audit Documentation

The Group expressed concern about audit documentation requirements (ISA 230) in an audit environment where audit analytics are applied, page 14, point (i). Our view is that auditors will continue to document the identifying characteristics of the specific items tested, to satisfy audit standard requirements. However, we believe that emphasis on documentation requirements will increase as auditors begin to place more reliance on IT related controls in data-driven audits.

Specifically, ISA 230 should recommend auditors to focus on providing a rationale for the verification and validation of key data characteristics such as the inputs and system settings that are used to develop and perform analytics and the validation of such techniques. Further, quality control processes over the data analytic techniques at the firm level or engagement level should be recommended by the ISAs.

Similarly, the ISAs should recommend for auditors to assess the reliability of third-party analytics. Our view is that the ISAs should recommend auditors, at the very minimum, to review 1) system settings and 2) model settings (e.g. regression, neural networks, decision tree, etc.) to assure that they are in conformance and have not been manipulated. The level of evaluation of firm-wide or third party analytics may not need to be extensive. For example, it may be practical to validate automated audit tests by performing a simulation test, with dummy data, to evaluate whether the output of the analytic is appropriate and may be used for audit procedures. Quality control processes for data analytic procedures that are used to obtain audit evidence can facilitate the inspection process by providing oversight authorities with a baseline from which audit procedures were subsequently conducted.

Audit Opinion

As the profession seeks to apply innovative technologies to meet stakeholders' demands for more transparent and timely reporting, standard-setters and auditors should consider revisions to the traditional audit opinion. Today, the audit opinion reflects a static assurance model, however, as audits become data driven, the "point in time" audit opinion report may become obsolete since it is issued weeks, even months, after the financial statements have been finalized. Therefore, the information presented on the audit opinion report may not be relevant by the time it reaches stakeholders. The dynamic nature of ERP systems that track the flow of organizational financial data can become a platform for CA systems to be embedded on and thus, provide real-time assurance. It is our view that in the future, audit opinions will be presented quantitatively and/or qualitatively, and most importantly, in real-time. Additional research is necessary to fully explore the implications of the future audit opinion.

Cybersecurity Concerns Regarding Audit and Data Analytics

Finally, strong technology innovation enables auditors to generate multi-dimensional audit reports in real-time. However, in line with developments in technology, including digitalized documents and interconnected technology platforms, firms are increasingly exposed to the risk of cyberattacks (Bailey, Miglio, and Richter 2014). Adverse cyber incidents against the firms, in turn, can negatively affect the latter's stock prices. According to a PricewaterhouseCoopers report (2016), the average number of detected cyberattacks increased 38 percent between 2014 and 2015. Considering this exponential increase and its consequent effect on stock prices (Chai, Kim, and Rao 2011), internal and external auditors need to prioritize firms' cybersecurity in order to safeguard assets, including client information (Brown-Liburd, Mock, Rozario, Vasarhelyi 2017). In addition, these and other related technology concerns would require expanded efforts from the auditors, resulting in higher audit fees (Li, No, and Boritz 2017). Furthermore, with respect to the audit data analytics, the matter of cyberattacks, including data breach events, warrants particular attention, considering the essential nature of data validation and verification.

Comments to the Group on ISA 540 and 240

We concur with the Group's approach to modernize ISA 540 to better reflect the audit of accounting estimates, which may rely on large volumes of system-generated data. Specifically, we agree that ISA 540, paragraphs 8 (c) and 8 (c) ii, pertaining to the auditors' understanding of the data, and the controls that generate such data, should be modified to recommend the use of data analytic techniques. Data analytic techniques can effectively assist the auditor in verifying management assertions such as completeness, accuracy, and cut-off. Furthermore, the Group may study the impact of ISA 240 relating to fraud in financial statements. In an audit environment where data analytics can be performed on a continuous basis to gather audit evidence, it is possible that fraud may be mitigated, as continuous checks and controls are in place, or that it may be detected in a timely manner. In a recent study, Liu and Moffitt (2016) employ text mining techniques to SEC comment letters to assess the likelihood of a firm restating their financial results and find that the probability of restatement of 10-K filings is positively associated with the strong words in comment letters.

Similarly, machine learning methodologies such as neural networks, logistic regressions and support vector machines could be used to predict the likelihood of fraud in financial statements

(Perols 2011). Future research may benefit the profession by examining whether text mining or other machine learning methodologies could be used to evaluate the likelihood of fraud based on certain risk-indicators, such as the probability of restatement. It is important to note that data analytics is a methodology and does not replace professional judgment nor skepticism. Rather, it would be the auditors' responsibility to assess the results of the analytic and perform further testing, or fraud inquiries, as deemed necessary.

***Question c**: To assist the DAWG in its ongoing work, what are your views on possible solutions to the standard-setting challenges?*

It is critically important for accounting firms and academic institutions to maintain communications with the Group to surpass standard-setting challenges. In this manner, the Group can be aware of the application of data analytics in the different phases of the audit (e.g. planning, fieldwork, concluding phases), and the impact and potential challenges that arise from such application. As mentioned above, auditors may encounter that the costs of validating non-traditional external data or performing CA procedures for certain financial statement accounts may exceed the benefits, therefore, it may not be beneficial for auditors to use external Big Data or CA techniques as it may not add value to the audit. Academics should also keep the Group informed of recent developments and research findings that may have an impact on the audit profession or the audit process. Overall, active communication between accounting firms, academic institutions, regulators, the Group, and other standard setters is essential so that the standards reflect current practice and developments.

***Question d**: Is the DAWG's planned involvement in the IAASB projects currently underway appropriate?*

Yes, the Group's planned involvement is appropriate, however, the Group should also consider an experimentation program for standard-setting related to the application of data analytics in financial statement audits. It is our view that the "Big Four" and other accounting firms have expressed their interest in data analytics, yet they are hesitant to apply data analytics in their audits, or take credit for using analytics, because current auditing standards do not encourage it. Auditors

are especially concerned that they could face sanctions by audit oversight authorities if they deviate from current auditing standards. For these reasons, it is important for regulators, such as the IAASB, to explicitly recommend the use of new technologies and analytics and, at the same time, assure the profession that the renovation of the audit process is likely to occur in evolving phases.

***Question e**: Beyond those initiatives noted in the Additional Resources section of this publication, are there other initiatives of which we are not currently aware of that could further inform the DAWG's work?*

The CarLab is not aware of any other initiatives that could further inform the Group's work. As expressed by the Group in the Additional Resources section, the RADAR, ICAEW and the CPA Canada initiatives are current projects that may be relevant to the Group. We also note that the PCAOB is beginning to monitor changes in practice and the implications related to the adoption of data analytics in the audit process.

***Question f**: In your view, what should the IAASB's and DAWG's next steps be?*

The DAWG should continue its active involvement in the exploration of data analytics in financial statement audits. There is tremendous opportunity for audit practitioners, standard-setters, audit oversight authorities and academics to collaborate and investigate the synergies between data analytics and financial statement audits. From an academic perspective for example, studies examining the application of various forms of data analytics in an audit engagement may provide evidence of how data analytics impacts the performance (e.g., skepticism, critical thinking, etc.) and judgment of auditors. Further, research can identify factors/circumstances that may lead auditors/firms to resist adoption of new methodologies. Research is also needed to further develop and examine the type of data analytics that can be effectively used during various phases of the audit. Additionally, an experimentation period involving auditors, clients and researchers should be conducted to measure the benefits provided from the use of data analytics in financial statement audits. This experimentation period, mirroring XBRL's voluntary filing program, should provide a safe harbor situation with agreements on the relaxation of anachronistic elements of the standards and agreed upon replacement rules.

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