

Audit Data Analytics Alert

AUDIT DATA ANALYTICS

JUNE 2016

Keeping Up with the Pace of Change

This Audit Data Analytics Alert (Alert) is being issued to raise awareness about data analytics in the context of the audit of financial statements. This Alert serves to explain the term audit data analytics and highlight the drivers/opportunities, and hurdles to overcome in regard to integrating more extensive use of data analytics into the audit of the financial statements.

Why Should I Read This Alert?

Auditors need to respond to ever-increasing and diverse uses of information technology by audited entities. More use by auditors of technology-enabled data analytics is an important aspect of that response. Auditors and others are encouraged to read this Alert and to consider (further) integrating or exploring the use of technology-enabled audit data analytics into the audit of financial statements.

1. Introduction and Purpose

- 1.1 The world is experiencing what has been called “a third great wave of invention and economic disruption set off by advances in computing and information and communications technology.” Large and diverse amounts of data are being used by audited entities of all types and sizes. As a result, aspects of the financial statement audit need to change if this service is to remain relevant and valued. Using

more technology-enabled analytics is seen as one important initial step. CPA Canada has formed an Audit Data Analytics Committee (the Committee) comprised of audit practitioners, internal auditors, members in business, and academia, to:

- obtain up-to-date information on the nature and extent of use of technology-enabled data analytics by auditors
- monitor developments in auditors' use of audit data analytics (e.g., innovative approaches being used by some auditors to keep pace with a changing technological environment, including accessing and making effective use of greater volumes and diverse types of data)
- provide useful input to auditors and other interested parties by developing non-authoritative guidance on these matters.

1.2 The purpose of this Alert is to highlight some initial thoughts of the Committee on:

- what audit data analytics entails
- drivers/opportunities and hurdles to consider in making more use of technology-enabled audit data analytics
- what can be expected from the Committee in the near term.

The aim is to engage auditors and others in this important initiative.

2. What Audit Data Analytics Entails

Definition

2.1 The American Institute of Certified Public Accountants (AICPA) has stated:

“Audit data analytics” is the science and art of discovering and analyzing patterns, identifying anomalies, and extracting other useful information in data underlying or related to the subject matter of an audit through analysis, modeling, and visualization for the purpose of planning or performing the audit.¹

2.2 Audit Data Analytics (ADAs) include analytical procedures, as defined in the Canadian Auditing Standards (CASs)² and many other types of analytics. Examples of ADAs are:

- ratio analysis
- trend analysis
- regression analysis
- general ledger account reconciliation and analysis
- journal entry analysis

¹ American Institute of Certified Public Accountants, Inc., *Audit Analytics and Continuous Audit, Looking Toward the Future*. (New York: AICPA, 2015), pp 92-93. www.aicpa.org/interestareas/frc/assuranceadvisoryservices/downloadabledocuments/auditanalytics_lookingtowardfuture.pdf

This definition originally appeared in the AICPA White Paper “Reimagining Auditing in a Wired World”, August 2014, authored by Paul Byrnes, Tom Criste, Trevor Stewart and Miklos Vasarhelyi. www.aicpa.org/InterestAreas/FRC/AssuranceAdvisoryServices/DownloadableDocuments/Whitepaper_Blue_Sky_Scenario-Pinkbook.pdf

² CAS 520, Analytical Procedures, para. 4.

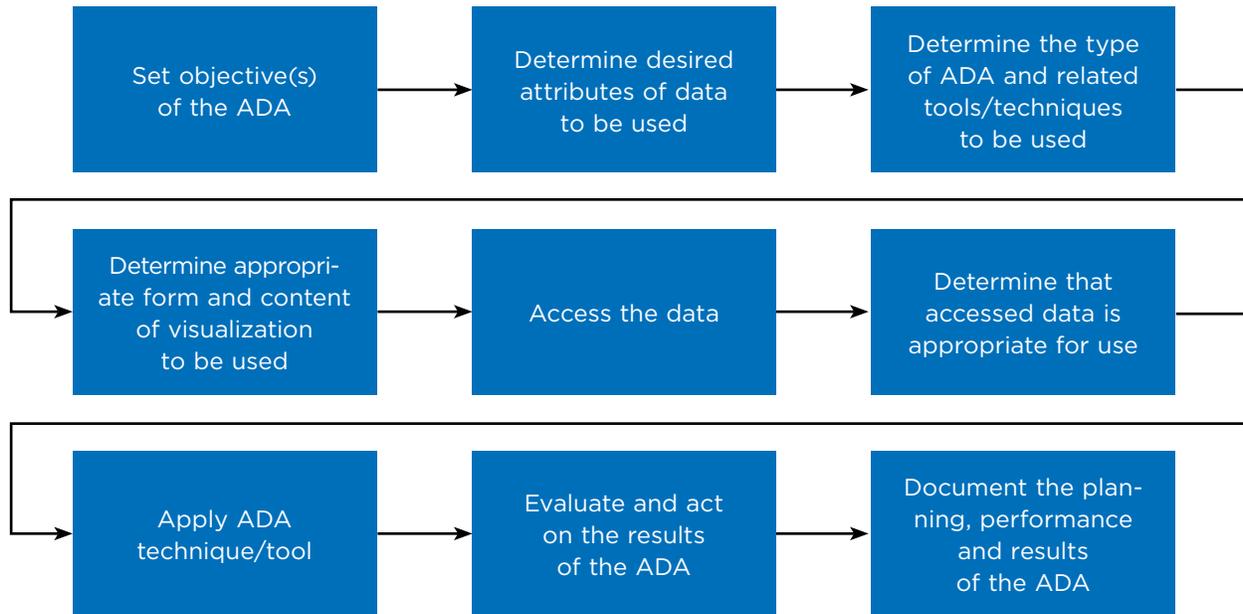
- segregation of duties analysis
- three-way match procedure³
- cluster analysis⁴
- data mining⁵

Planning, performing and drawing conclusions from ADAs

2.3 ADAs may be used in any phase of the audit: planning, risk assessment, responding to risk assessments (as tests of controls or substantive procedures) and in drawing an overall conclusion from the audit.

2.4 Diagram 1 sets out key steps in performing most ADAs. As with any audit procedure, an ADA has to be appropriately planned and performed. This involves key decisions regarding the objectives of the ADA, including the assertions to be addressed and how the ADA is expected to contribute to dealing with audit risk.

DIAGRAM 1—BASIC STEPS IN MOST ADAs



3 In a *3-way match procedure*, key data in three different but related documents are compared and mismatches are analyzed. For example, the auditor may be auditing the existence and accuracy of revenue. The relevant documents would be all the invoices, shipping documents and customer order documents for the period under audit. Using automation, the auditor compares, for every document, the invoiced customer, quantity, and unit price to the quantity shipped per the shipping documents and the quantity and unit price reflected in the sales order received from the customer.

4 *Cluster analysis* is a statistical classification technique in which cases, data, or objects (events, people, things, etc.) are sub-divided into groups (clusters) such that the items in a cluster are very similar (but not identical) to one another and very different from the items in other clusters. It is a discovery tool that reveals associations, patterns, relationships, and structures in masses of data. (Source: Business Dictionary.com. www.businessdictionary.com/definition/cluster-analysis.html)

5 *Data mining* is the process of collecting, searching through, and analyzing a large amount of data in a database to discover patterns or relationships. (Source: Dictionary.com <http://dictionary.reference.com/browse/data-mining>)

2.5 Matters to note regarding diagram 1 include the following:

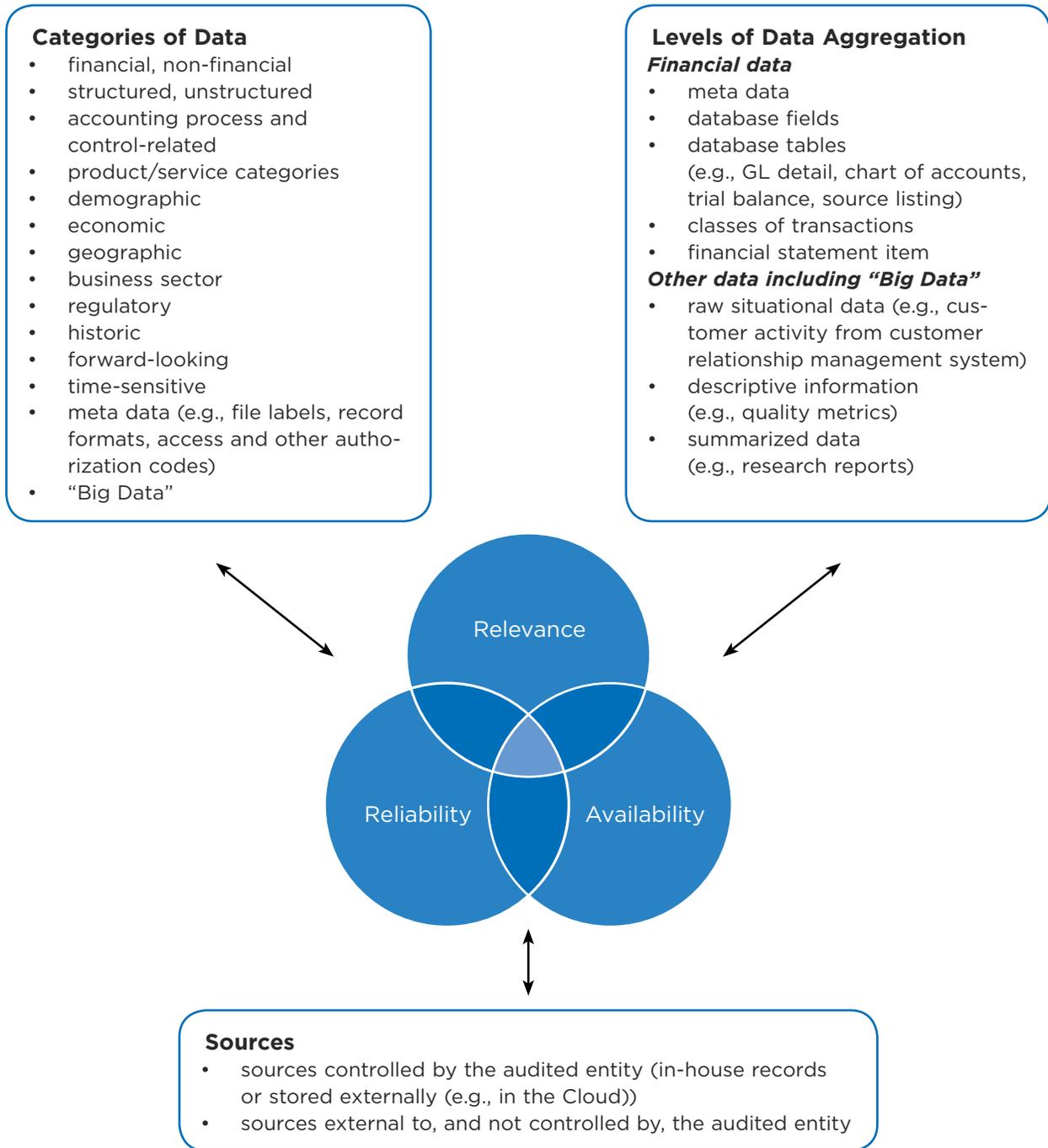
- Not all steps necessarily apply to all ADAs. For example, a feature that often distinguishes ADAs from other types of audit procedure is the use of visualizations (e.g., charts, scatter diagrams, trend lines, bubble charts and tables). Their use may help the auditor to quickly identify matters that may be significant to the audit. However, not all ADAs necessarily include the use of visualization.
- Not all steps will always be performed separately. For example, setting the objectives and determining the desired attributes of data might be a combined step in the process.
- Decisions made in the initial design and performance of an ADA can provide a sound basis for use in subsequent years. The use of an ADA may become more efficient and effective once the initial learning curve has been addressed.
- As with any audit procedure, the planning and performance of an ADA is iterative (i.e., appropriate changes are made to the ADA to respond to new information that becomes available to the auditor).

Breadth, depth and other characteristics of data used in ADAs

2.6 As noted in Diagram 1, a key step in planning and performing an ADA is to determine the desired attributes of data to be used. Diagram 2 shows an example of how data of potential use in an ADA may be categorized. It must be decided at what level data to be used in the ADA should be aggregated (or disaggregated). For example, use of disaggregated data may sometimes provide a clearer and deeper understanding of matters affecting the risk of material misstatement.

2.7 Data reliability, relevance, and availability are core attributes of data used in most ADAs. Because each of these attributes may range in level from high to low, the auditor's judgments may be affected as to what data can be used and, if any, how. For example, data may have higher reliability if they come from a system for which internal controls are operating effectively. Data obtained by auditors from sources other than the audited entity (such as from sources on the Internet) may, in some respects, be more reliable since they will not have been subject to possible bias by the entity's management. On the other hand, the auditor may not have any means of assessing whether externally sourced data comes from well-controlled systems.

DIAGRAM 2—EXAMPLES OF DATA ATTRIBUTES THAT MAY BE CONSIDERED IN PLANNING AND PERFORMING AN ADA



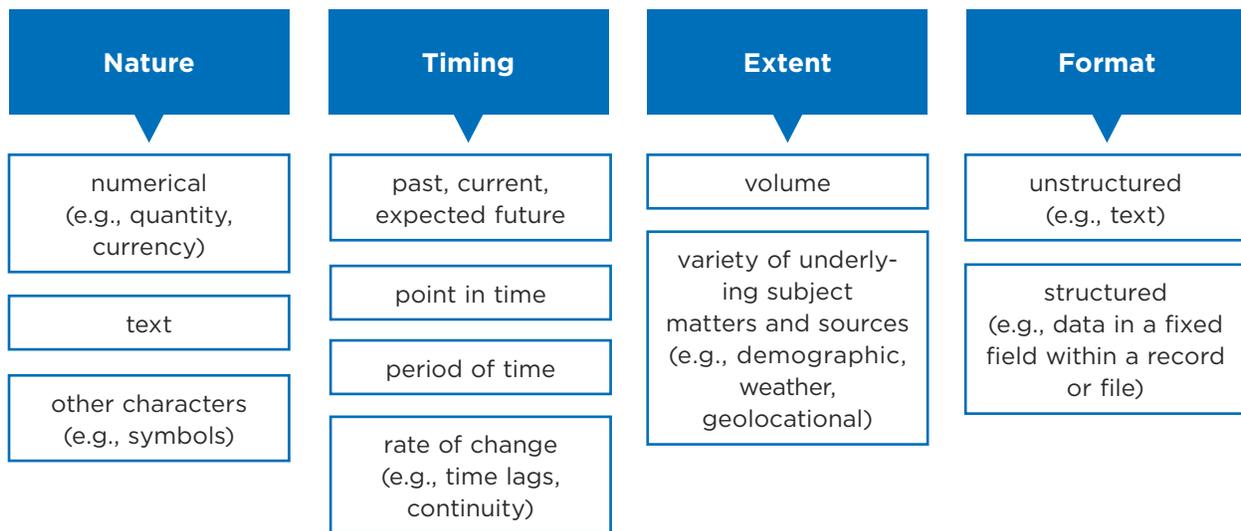
Reliability: Data are accurate, complete and reflect the substance of underlying subject matter to an extent consistent with the objective of the ADA.

Relevance: Data have a significant bearing on achieving an objective of the ADA being performed.

Availability: Data needed to perform the ADA can be obtained or accessed in a cost-effective timely manner.

- 2.8 The need to consider, and in some cases evaluate, data reliability will vary with the purpose of the ADA. Data reliability may not be applicable for ADAs that are exploratory in nature. For example, text mining may be used to scan contracts for key clauses. Also, some ADAs may be used as tests of controls, one objective of which may be to assess data reliability. In that case, there would not necessarily be any assessment of data reliability in advance of performing the ADA.
- 2.9 Diagram 3 provides a more granular way to look at data attributes. For example, whether the data are structured or unstructured will be a matter to consider in designing and performing the ADA.

DIAGRAM 3—MORE GRANULAR WAY TO VIEW ATTRIBUTES OF DATA

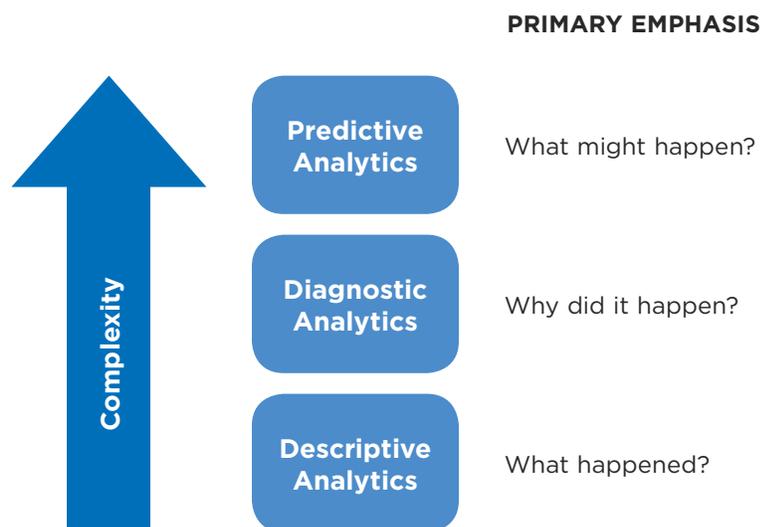


Different categories and types of ADAs

- 2.10 Diagram 4 shows often-cited categories of analytics.⁶ This categorization may be useful when determining what type of ADA might best suit the objective of the procedure. Traditional analytical procedures such as trend analysis might often fit into the “descriptive analytic” category. A more complex statistics-based ADA, such as regression analysis, might fit into the “diagnostic analytics” category. However, an ADA often may fit into more than one category, perhaps even all three categories.

6 See Gartner IT Glossary: www.gartner.com/it-glossary/. The Gartner categories of analytics also include “prescriptive analytics,” which are not commonly used by auditors. Prescriptive analytics is defined as a form of advanced analytics, which examines data or content to answer the question “What should be done?” or “What can we do to make ____ happen?” and is characterized by techniques such as graph analysis, simulation, complex event processing, neural networks, recommendation engines, heuristics, and machine learning.

DIAGRAM 4—EXAMPLES OF CATEGORIES OF ANALYTICS



3. Drivers/Opportunities and Related Hurdles to Overcome

3.1 Diagram 5 sets out examples of key drivers and opportunities that indicate a need for external auditors of financial statements to embrace the use of robust technology-enabled ADAs. This diagram also sets out some significant hurdles that would need to be overcome.

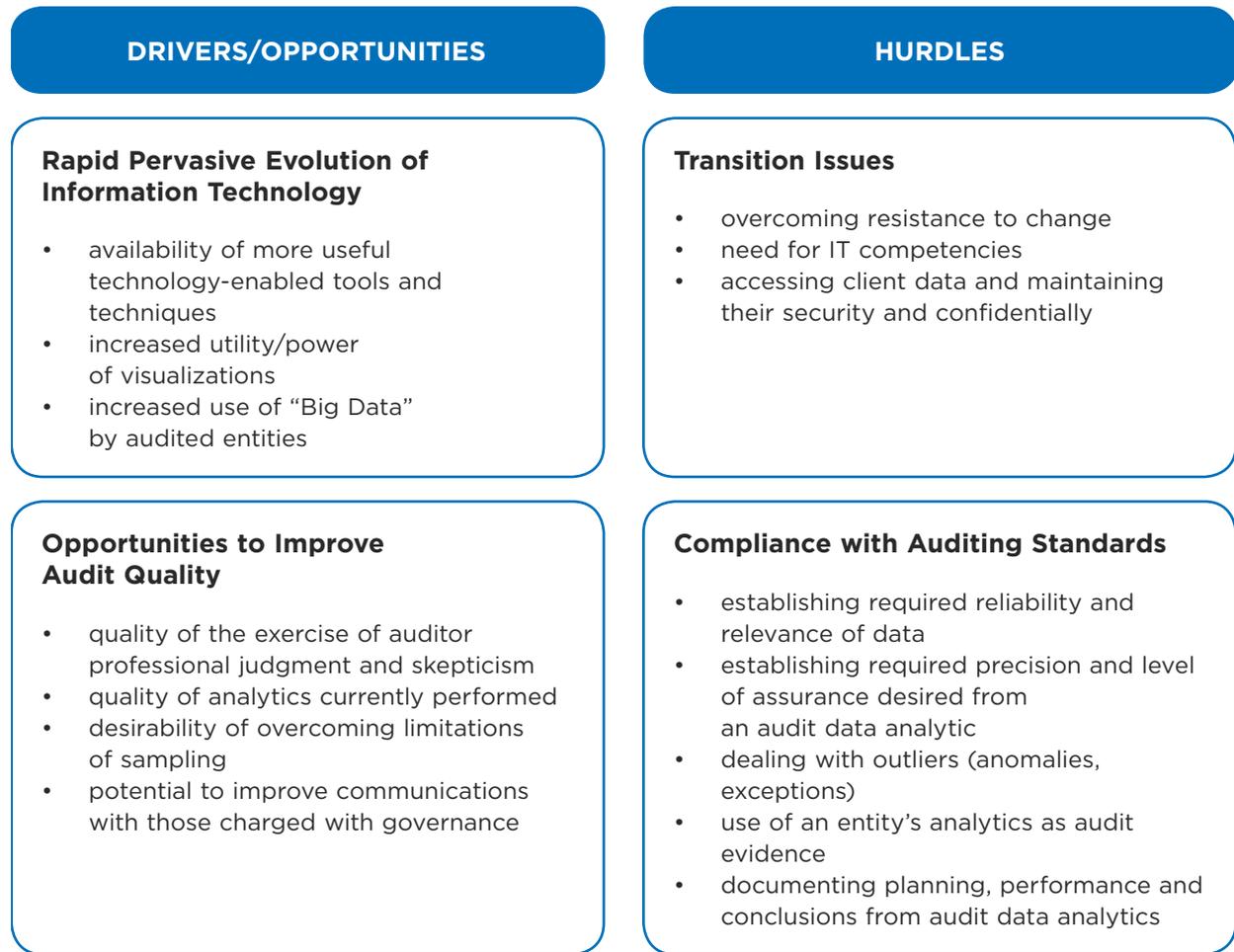
3.2 The following are examples of matters that are quickly changing:

- *Increased use of Big Data by audited entities:* One definition of “Big Data” is “high-volume, high-velocity and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision making, and process automation.”⁷ Big Data are being used to improve the efficiency and effectiveness of all sizes of organizations in meeting stakeholder needs. Auditing standards require auditors to obtain an understanding of the entity and its environment, including those related business risks that may result in risks of material misstatement.⁸ Use of Big Data by the entity may significantly affect how it addresses business and related risks. For example, using Big Data may enable even small retail entities to use more effective models to make their buying processes more sophisticated. This may reduce the chances of buying goods that subsequently will be difficult to sell and perhaps have to be written off. Changes in business models resulting from the use of Big Data may, for example, change assumptions on which accounting estimates should be based, and therefore have consequences for the audit of those estimates.

7 Gartner IT Glossary: www.gartner.com/it-glossary/big-data

8 Paragraph 11 (d) of CAS 315, *Identifying and Assessing the Risks of Material Misstatement Through Understanding the Entity and Its Environment*.

DIAGRAM 5—EXAMPLES OF DRIVERS/OPPORTUNITIES AND HURDLES TO OVERCOME



- *Increasing availability of more useful technology-enabled tools and techniques:* Audit software providers and public accounting firms continue to enhance tools and techniques available for performing ADAs. Frequently used business software such as Excel contains effective data analytic tools that continue to evolve. Even traditional hurdles such as data accessibility are being lowered. For example, to assist with data conversions, the AICPA has developed voluntary, uniform **audit data standards** that identify the key information needed for audits and provide a common framework covering:
 - data file definitions and technical specifications
 - data field definitions and technical specifications
 - supplemental questions and data validation routines to help auditors better understand the data and assess its completeness and integrity.

These audit data standards can be used in conjunction with XBRL.

- *Utility/power of visualizations:* ADAs produce results in many visualization formats (e.g., graphic, dashboard, patterns, clusters, tables). Such visualization capability may better enable auditors to identify and respond to matters significant to the audit.
- *Communications with those charged with governance (such as the audit committee or, for a small entity, the owner-manager):* Auditors are required to communicate with those charged with governance regarding specific matters as well as “other matters, if any arising from the audit that, in the auditor’s professional judgment, are significant to the oversight of the financial reporting process.”⁹ The auditor’s use of ADAs may provide useful insights into such matters that might not otherwise come to light using other procedures. Also, matters of concern may be relatively easily explained through graphs, charts or other visual formats used with ADAs.

Opportunities

3.3 The need for continued improvement in audit quality is likely to help drive the use of more rigorous technology-enabled analytics.

- *Quality of professional judgment/skepticism:* Auditing standards require auditors to exercise professional judgment and professional skepticism.¹⁰ A study by the Global Public Policy Committee *Enhancing Auditor Professional Skepticism* notes common judgment tendencies in auditors that can lead to bias and weaken skepticism. These are:
 - overconfidence (overestimation of the auditor’s own abilities)
 - confirmation (placing more weight on evidence that confirms management’s position than on evidence that refutes it)
 - anchoring (always using as a starting point, and being overly influenced by, initial numbers recorded by the entity)
 - availability (the tendency to consider information that is more readily available from memory as being more likely relevant and more important for a judgment).¹¹

Technology-enabled ADAs often involve the use of broader and deeper ranges of disaggregated information. This may be important in overcoming tendencies toward bias and thereby help improve audit quality.

- *Quality of ADAs currently being performed:* Audit regulators have sometimes expressed concerns about failure by auditors performing substantive analytical procedures to properly establish matters such as precision of expectations and

9 CAS 260, *Communications with Those Charged with Governance*, para. 16(d).

10 CAS 200, *Overall Objectives of the Independent Auditor and the Conduct of an Audit in Accordance with Canadian Auditing Standards*, paras. 15 and 16

11 Steven M. Glover and Douglas F. Prawitt, *Enhancing Auditor Professional Skepticism*, Global Public Policy Committee, Nov. 2013, p. 11. www.thecaq.org/docs/research/skepticismreport.pdf

reliability of data. Auditors also may not properly investigate variances arising from the analytical procedures performed. Use of technology-enabled analytics may provide opportunities to apply and demonstrate more rigour in these areas.

- *Possible reduced use of statistical sampling:* Auditors often use statistical sampling for tests of controls and substantive procedures. ADAs often enable the efficient and effective examination of 100% of the items in a population of data underlying the entity's financial statements, at various levels of aggregation. This may enable auditors to reduce the use of sampling and thereby sampling risk (i.e., the risk associated with the auditor's conclusion based on a sample) may be different from the conclusion if the entire population is subjected to the same procedure).¹²

Hurdles

- 3.4 There are also hurdles to overcome in implementing change. These hurdles are in some respects linked to the drivers and opportunities noted above. Examples of these hurdles are set out below.

Transition issues

- 3.5 Making more use of technology-enabled analytics may entail a significant transition for many auditors. This transition may not always be easy, for reasons that include those set out below.
- *Resistance to change by firms and individual auditors:* Auditing firms, or certain individuals in those firms, may resist adopting more robust technology-enabled ADAs. Such change will involve cost/benefit analyses. Often, the costs (e.g., software acquisition costs, training) are relatively easy to estimate. On the other hand, potential benefits (e.g., improved audit quality, work satisfaction among staff, potential increased efficiencies over the near-to-longer term) are less tangible and harder to estimate and may therefore tend to be given less weight. On balance, it is anticipated that many auditors will embrace the use of more technology-enabled analytics in the near term to keep pace with increased use of information technology by audited entities. Those auditors who do not keep pace may lose out to competitors.
 - *Difficulty in increasing the breadth and depth of auditor competencies:* Using technology-enabled ADAs will often involve obtaining information meaningful to the audit from large data sets (both financial and non-financial) located in various sources (both inside and outside the audited entity). Auditors will often require more and different IT skills to effectively perform the ADAs. In addition, improved analytical skill sets may be needed for auditors to decide appropriately, for example, what data to target, what types of information within the data are important, what analytical tools should be used and when, and how results can best be presented and communicated. Auditing firms may be willing and

¹² CAS 530, *Audit Sampling*, para. 5(c).

able to devote resources to training existing and new staff and partners to help them obtain these skills sets. This will vary among firms (i.e., firm size and client composition being some factors affecting this). However, for auditors to keep pace with changes in the business environment, there will have to be increased emphasis on IT and analysis as part of the core competency training of CPAs, including university programs.

- *Difficulty in obtaining readily usable data:* Some data that auditors want to use for an ADA, including “Big Data,” may be outdated, missing, or inaccurate. Also, some entities may have a patchwork of systems, including a number of legacy systems, or use a myriad of small applications. These matters may make it difficult, for example, for auditors to access data efficiently that are in a usable format. As audited entities work to improve the quality of data for management purposes, they also have a positive effect regarding the use of ADAs.
- *Resistance by audited entities to having their data accessed by auditors’ systems:* Audited entities need to maintain the integrity of their data. Some may have concerns that analyses performed by auditors may corrupt or change the data. In addition, some entities may worry that data security breaches (i.e., unauthorized access by third parties to their data) may result, for example, when auditors have exported company data to the auditor’s systems. Means are available to help address these issues.

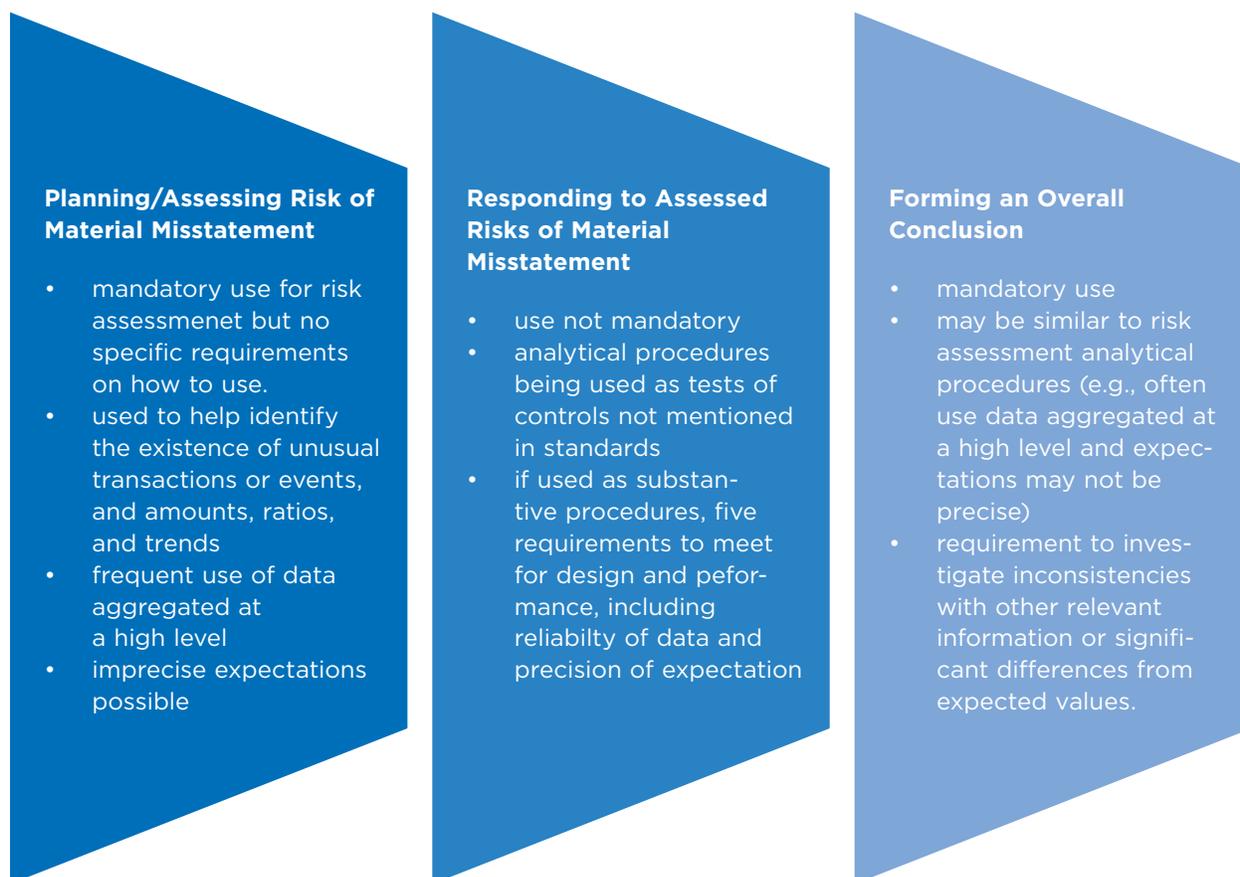
Compliance with auditing standards

3.6 Auditors performing ADAs need to comply with relevant CASs. “Analytical procedures,” as defined in the CASs, are one type of ADA.¹³ Under this definition, an analytical procedure entails the development of an expectation of plausible relationships or values. Developing such expectations is not part of performing other types of ADAs. Also, as demonstrated in Diagram 6, the CASs include specific requirements and other guidance regarding the use of analytical procedures.¹⁴ These specific requirements are over and above requirements that apply to other audit procedures, including other types of ADAs.

¹³ AS 520, *Analytical Procedures*. Para. 4.

¹⁴ Use of analytical procedures in assessing risks is required by CAS 315, *Identifying and Assessing Risks of Material Misstatement Through Understanding the Entity and its Environment*, para. 6(b). Auditors who decide to use analytical procedures as substantive procedures need to meet various requirements in CAS 520. Also, CAS 520, para. 6 requires the use of analytical procedures as part of forming an overall conclusion from the audit.

DIAGRAM 6 – USING ANALYTICAL PROCEDURES UNDER THE CANADIAN AUDITING STANDARDS



3.7 The CASs require the use of professional judgment in determining the nature, timing and extent of all audit procedures including ADAs, taking into account the particular circumstances of the engagement. Use of ADAs is not meant to be simply an add-on to other types of procedures. An ADA will often be an effective and efficient approach to meeting an audit objective; however, just because a tool or technique is available, this does not mean it has to be used.

3.8 Examples of matters that may need to be considered as auditing standards evolve to recognize increasing use of technology-enabled ADAs include the following:¹⁵

- *Establishing the reliability and relevance of data:* There are many facets to how the concepts of reliability and relevance of data apply to ADAs that may need to be more specifically dealt with in standards. Examples follow:
 - For some ADAs, the concept of reliability may not apply. For example, auditors may perform text mining of unstructured data (e.g., emails, postings to chat sites) in assessing the risk of fraud, where there is no expectation of data reliability (e.g., accuracy, completeness).

¹⁵ CAS 230, *Audit Documentation*.

- More robust technology-enabled ADAs often may involve the use of wide varieties of data (including Big Data obtained from external sources) the reliability of which may in some cases be questionable. For example, it may not always be practicable to determine the reliability/objectivity of the source of the data, and the data may not be subject to controls that could be tested by the auditor. Standards likely would need to deal more specifically with this issue.
- *Establishing the precision of the auditor's expectation and desired level of assurance:* There are types of ADAs that may not specifically involve setting a sufficiently precise expectation or level of assurance to be achieved. For example, some ADAs may involve examination of attributes of 100% of a data population. However, that does not mean, for example, that 100% assurance has been achieved. The implications of the auditor having considered 100% of items in a population may need to be addressed more specifically in standards (including dealing with outliers as noted in the bullet below).
- *Dealing with outliers:* In using sampling, the auditor is required to investigate the nature and cause of any deviations or misstatements identified and evaluate their effect on the purpose of the audit procedure and on other areas of the audit.¹⁶ CAS 530 also defines an “anomaly” as a “misstatement or deviation that is demonstrably not representative of misstatements or deviations in a population.”¹⁷ ADAs often involve examining aspects of 100% of the data in a population. Depending on the objective and nature of the ADA being performed, a very significant number of “outliers” may be identified. Outliers are sometimes referred to as anomalies, exceptions, or deviations. These may reflect data attributes that do not fit with what has been defined as “normal” or “expected” for the given data population. Unlike the approach taken in CAS 530, these outliers are not necessarily treated as misstatements. Also, if the number of outliers is large, it may not be practicable to investigate them all. In particular, it is important that auditors not be required to investigate matters where the risk of material misstatement is likely to be low. It will be important to develop practicable and rigorous means of properly narrowing down the nature and number of outliers to be investigated. It might be beneficial, for example, if standards were to provide guidance around this narrowing process.
- *Using audit data analytics performed by internal auditors:* Internal auditors may perform their own ADAs. External auditors may want to use this work. Several issues may have to be resolved regarding the nature and extent of work the external auditor would be expected to perform to comply with the requirements in CAS 610, *Using the Work of Internal Auditors*.

¹⁶ CAS 530, para. 12.

¹⁷ CAS 530, para. 5(e).

- *Using management's analytics as audit evidence:* In cases where management of the audited entity makes use of analytics for its purposes, issues may arise as to whether and how these analytics may be used as forms of audit evidence.
- *Documenting use of various types of ADAs:* Auditors have to make many decisions regarding which ADAs to use and how best to use them. These decisions are content- and context-specific, requiring auditors to use professional judgment. Also, the approach taken and the data used may be refined throughout the process of using an ADA after trial runs. Further, various aspects of techniques and tools used in an ADA (e.g., interactive dashboards) are not easy to document. Therefore, it is not clear what the nature and extent of the documentation of these and other aspects of the performance and review of ADAs should be.

4. What May Be Expected from the Committee in the Near Term

- 4.1 The mandate of the Committee includes assisting in:
- conducting research regarding the use of ADAs
 - creating thought leadership (white papers), non-authoritative audit guidance (alerts, tools, FAQs, client briefings, and guides), and support determined on an “as needed” basis (e.g., webinars)
 - advocating for practitioners’ use of ADAs
 - determining the optimal skillset for future CPA auditors in order to sustain market demand for CPA auditors.
- 4.2 For example, representatives of the Committee are now proactively collaborating with the AICPA and their Audit Analytics Guide Task Force on the development of an updated version of the AICPA Audit Guide *Analytical Procedures*. This comprehensive Guide, with appropriate amendments, will be issued as non-authoritative audit guidance in Canada (Note: The title of this Guide has yet to be determined.) and will provide foundational guidance to auditors of all sizes on the use of data analytics in the audit of financial statements.¹⁸ The Committee will also respond to requests from other bodies, such as the International Auditing Standards Board, which are undertaking initiatives regarding ADAs.

¹⁸ In the U.S., audit guides are “interpretive publications” that auditors are required to consider in planning and performing audits. Canada does not have equivalent authoritative guidance (i.e., the purpose, scope and content of Canadian “Assurance and Related Services Guidelines” are different from AICPA Audit Guides).

- 4.3 This Alert is the Committee's first communication to auditors and other interested parties. The plan is to follow up this communication in the near term with:
- a survey of practitioners from all sizes of firms who perform financial statement audits to obtain a better understanding of the current use of ADAs and matters relevant to moving forward to more use of technology-enabled ADA
 - further communications exploring in more detail some of the key matters noted in this Alert
 - publishing the Canadian non-authoritative audit Guide, referenced in paragraph 4.2.
- 4.4 Materials will be posted from time to time on a landing page on the [CPA Canada website](#) devoted to ADAs.
- 4.5 The Committee looks forward to having extensive and timely interactions with auditors, standard setters, regulators, and other interested parties related to this initiative, recognizing that adoption of technology-enabled ADAs is likely to be gradual: change does not often happen overnight.

Additional Resources

- CPA Audit Data Analytics Committee Landing Page—cpacanada.ca/auditdataanalytics
- CPA Canada Webinar—[Business Analytics Part 1: An Introduction to Analytical Thinking](#)
- CPA Canada Webinar—[Business Analytics Part 2: Implementing Analytics in Your Organization](#)
- CPA Canada Webinar—[New Insights, New Models: The Power of Big Data and Analytics](#)
- AICPA [Audit Data Standards](#)—Voluntary, recommended data standards for the extraction of information. These data extract standards do not represent authoritative auditing or accounting standards.
- AICPA Publication—[Audit Analytics and Continuous Audit: Looking Toward the Future](#)

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