

# Audit Data Analytics Alert

## AUDIT DATA ANALYTICS

SEPTEMBER 2017

## Survey On Use of Audit Data Analytics in Canada —Results and Possible Implications

### CPA Canada Audit Data Analytics (ADAs) Survey Results Summary

#### Main topics

- Nature and extent of use of ADAs and factors driving or inhibiting use

#### Respondents

- 394 auditors responded from both large and small/medium-sized firms and offices in various locations across Canada who audit organizations of varying size and industry.
- 49% of respondents were audit partners.

#### Highlights\*

- 46% of respondents have used some form of ADAs (63% from large firms, 39% from small/medium-sized firms).
- 20% of respondents overall have used advanced ADAs (see page 6).
- 92% of respondents have used some form of analytical tool (mostly Excel-based) including for purposes other than ADAs (see page 7).

- Use of ADAs is not significantly related to respondent demographics (e.g., age, gender) (see page 8).
- Percentage of users of ADAs in an office increases as office size increases (see page 7).
- ADAs are more often used in auditing assertions that require relatively less judgment and decision-making expertise (see pages 8 and 9).
- Whether ADAs are used to provide primary or corroborative sources of evidence varies with firm size, size of client and whether the assertions being audited relate to transaction streams or balances (see page 10).
- Client expectations, a desire to achieve competitive advantage and ADA training opportunities drive use of ADAs (see pages 11 and 12).
- The most frequently identified impediments to use of ADAs are inadequate technical and statistical knowledge, inadequate training opportunities, as well as cost (see pages 12 and 13).
- There is a relatively strong association between firm size and the regulatory environment as an impediment to further integration of ADAs into the audit of financial statements; the same association is present as the audit engagement size increases (see page 12).

\* Page references in brackets above refer to the section of the Alert where the highlight is explored.

### **Possible Implications**

- There is a need for further research to obtain information on reasons why firms of different sizes are taking different approaches.
- Key decisions need to be made by firms as to how best to provide training in the use of ADAs (e.g., focus on training a few experts or use training to provide all auditors with a functional (i.e., non-expert) knowledge of various ADA tools).

## Purpose of This Publication

Are Canadian auditors using audit data analytics (ADAs)? What factors are driving or impeding such use? Those were two key issues explored in a 2016 survey commissioned by CPA Canada to understand how Canadian auditors are using ADAs in performing financial statement audits.

Data analytics is getting more attention in the audit world. Auditors in Canada and elsewhere are facing an ever-changing marketplace where increased use of technology, including ADAs, is likely to be vital to performing high-quality audits that meet the needs of modern-day information users. Findings from this survey may have significant implications for individual auditors, firms, and the Canadian auditing profession as a whole when making key decisions on how to integrate technology into financial statement audits.

This alert provides brief background information on the survey, key results obtained, and some possible implications of those results.

## Survey Background

Development of the survey and analysis of the results were supported by the CPA Canada Audit Data Analytics Committee and two University of Waterloo professors: Clark Hampton, Assistant Professor, Information Systems, and Theo Stratopoulos, Associate Professor, Information Systems.<sup>1</sup>

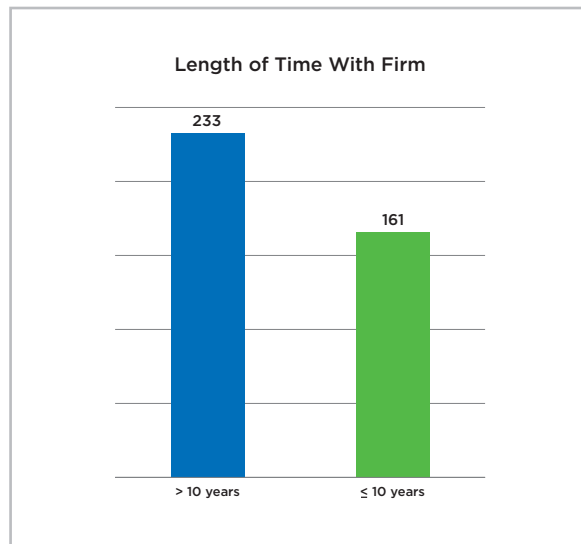
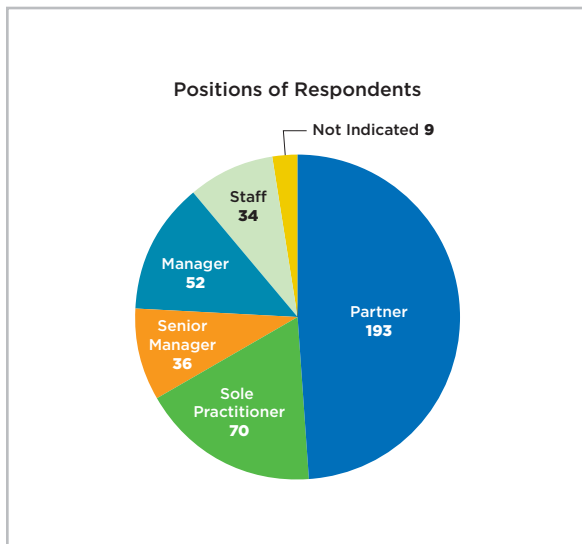
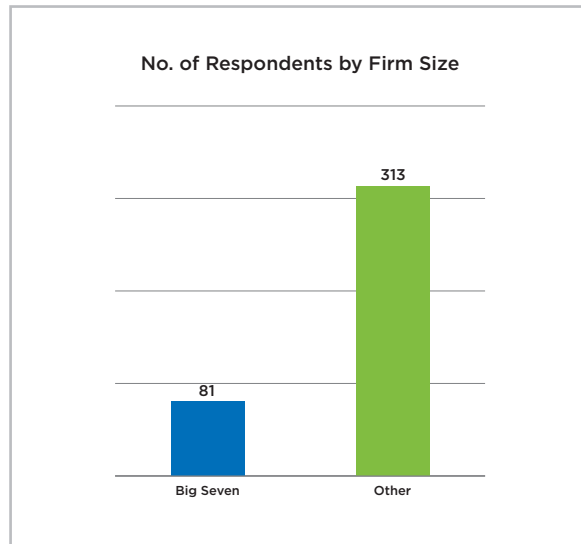
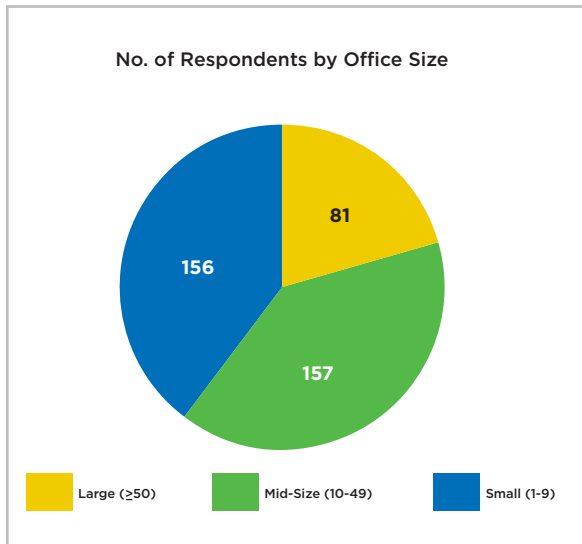
## Respondent Demographics

There were 394 respondents to the survey. Exhibit 1 summarizes characteristics of respondents based on responses to demographic questions. As shown, 81 respondents (21%) were from the seven largest firms, all of whom also worked in large offices. The other 313 respondents (79%) were from small/medium-sized firms and evenly divided among those who worked in mid-sized offices and those who worked in small offices.

In addition to the demographic data noted in Exhibit 1, the age of survey respondents ranged between 45 and 54 years. Women represented 37.8% of respondents; 49% of respondents were audit partners (herein, “partners”). Respondents were from across Canada and had wide variations in client mix and average hours spent per audit engagement.

<sup>1</sup> Between the survey and publication date, Clark Hampton, PhD, moved to the University of South Carolina.

**EXHIBIT 1—CHARACTERISTICS OF RESPONDENTS**



Respondents were also asked to indicate whether the majority of their audits were large or small. This classification was based on the perception of each respondent (e.g., there were no specifications based on audit hours provided). The responses are summarized in Exhibit 2.

## EXHIBIT 2—RESPONDENTS BY SIZE OF FIRM AND SIZE OF AUDIT

	Large Audits	Small Audits	Total
Large firm respondents	40	41	81
Small/medium-sized firm respondents	23	290	313
<b>Total</b>	<b>63</b>	<b>331</b>	<b>394</b>

### Descriptions of Types of ADAs and Tools Provided to Respondents

ADAs (the application of data analytics to auditing) involve the use of analysis, modeling and visualization to identify patterns and anomalies in data that may indicate possible misstatements, help focus auditor attention on higher-risk items and provide audit evidence. Using the power of information technology, an ADA may be used to analyze or test 100% of the items even in large data populations. This audit approach contrasts with, for example, audit sampling where not all items in a population are analyzed or tested.

The Appendix to this paper shows information provided to respondents regarding types of ADAs and related tools that might be used in an audit. Types of ADAs described included: visualization and descriptive statistics, advanced statistical analysis, optimization, and text mining.

A wide variety of possible tools was listed, including Excel. Respondents were asked to specify any other type of ADA or tool they had used.

### Topics Covered in the Survey

The survey was designed to obtain both facts and perceptions fundamental to understanding ADA adoption trends in Canada. Topics on which information was obtained included:

- Nature and extent of use of ADAs:
  - Who is using ADAs (firms and individuals within the firms)?
  - What types of ADAs and tools are being used?
  - In what phases of the audit are ADAs being used?
  - What assertions are being addressed by using ADAs?
  - Are ADAs being used to provide primary or corroborative sources of audit evidence?
- Factors driving or impeding the use of ADAs.

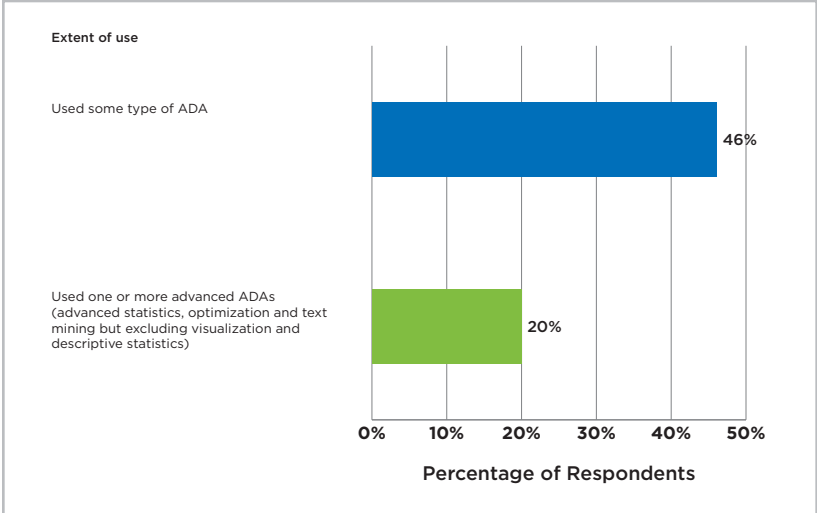
# Survey Results Regarding Nature and Extent of Use of ADAs and Tools

## Extent of Use of ADAs and Specific Analytical Tools

### Extent of Use of ADAs

Exhibit 3a shows that about 46% of respondents stated they had used some type of ADA (including descriptive statistics and visualization, text mining, advanced statistics and optimization) in performing an audit.<sup>2</sup> However, fewer than 20% had used what was described as a more advanced ADA. For purposes of our survey, an advanced ADA included advanced statistics, optimization and text mining, but excluded visualization and descriptive statistics.

EXHIBIT 3A – USE OF ADAs

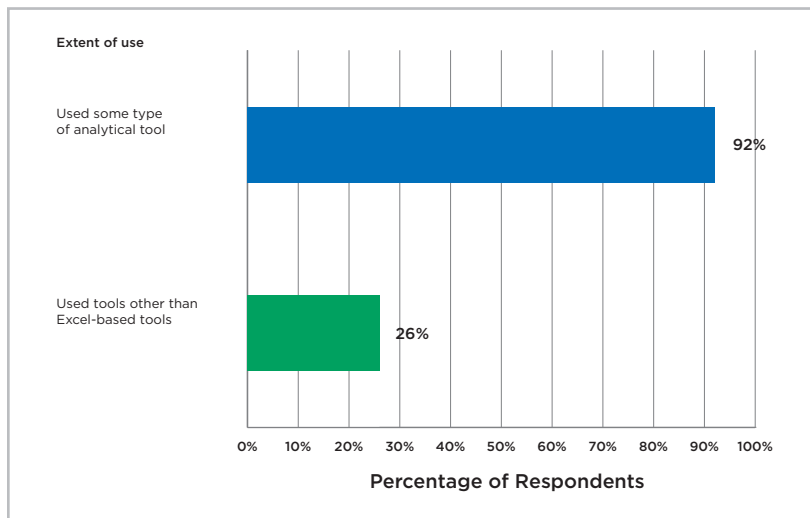


### Specific Types of Analytical Tool Used

By far the most commonly used tools were Excel-based. However, if Excel-based tools are removed from the specific list of tools surveyed, fewer than 26% of respondents used other specific analytic tools (e.g., business intelligence tools, advanced statistical packages, visualization tools, database management systems, and programming languages).

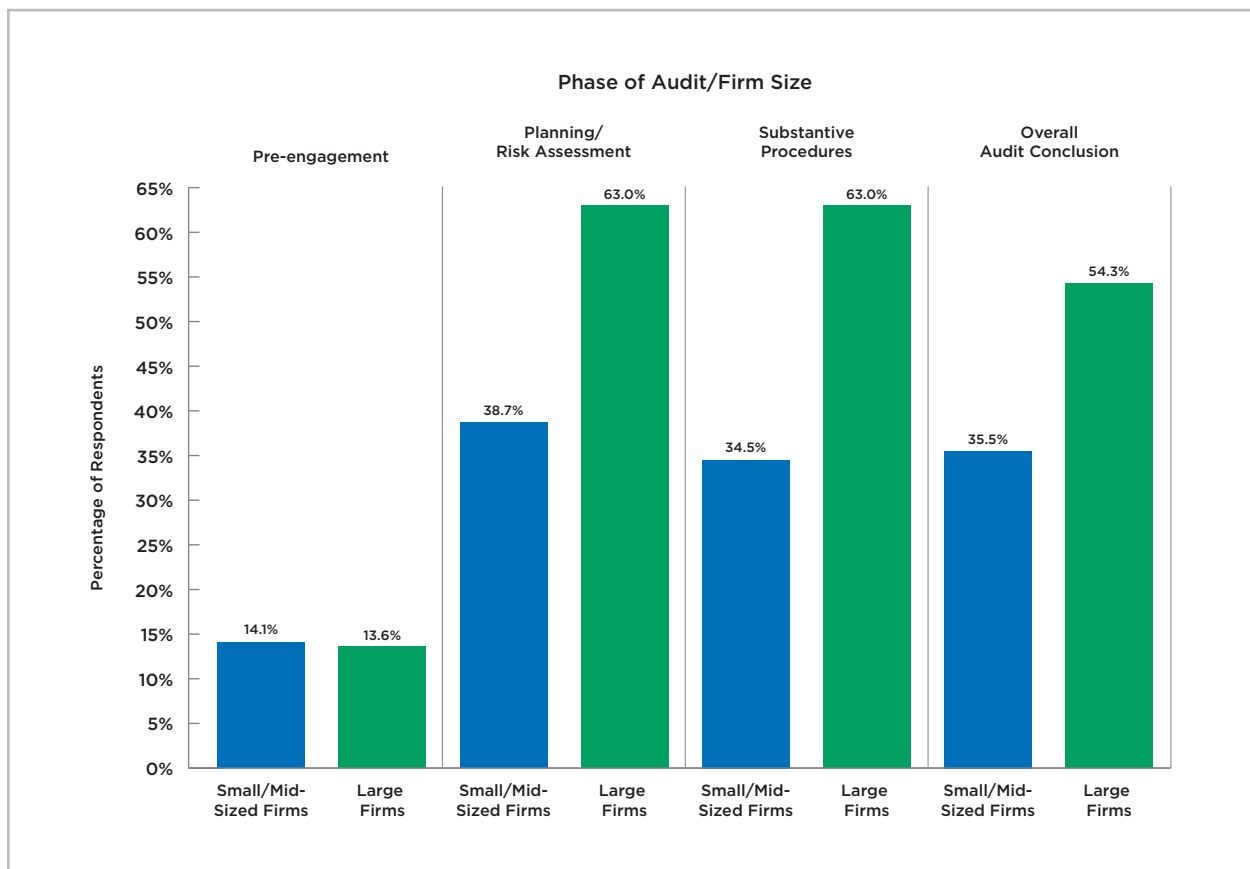
2 Note this statistic does not indicate frequency of use of ADAs in an audit or on multiple audits.

### EXHIBIT 3B—EXTENT OF USE OF TOOLS



The percentage of respondents who had used ADAs varied by size of firm, as indicated in Exhibit 4. Overall, 63% of auditors from large firms had used ADAs, as compared to 39% of auditors from small/medium-sized firms. Exhibit 4 also indicates the results of responses regarding use of ADAs in various phases of the audit.

### EXHIBIT 4—USE OF ADAs BY AUDIT PHASE



## Variations in Extent of Use of ADAs by Office Size

As indicated in Exhibit 5, the percentage of users of all types of ADAs in an office increases as office size increases. For example, there were 81 respondents from large offices, 31 (38%) of whom used advanced statistics on their audits. Only 6 (4%) of the 156 respondents from small offices used advanced statistics in their audits.

**EXHIBIT 5—PERCENTAGE OF RESPONDENTS (BY OFFICE SIZE) WHO USED VARIOUS TYPES OF ADAs**

Office Size	Visualization and Descriptive Statistics	Optimization	Advanced Statistics	Text Mining
Small (1-9)	28%	12%	4%	8%
Medium (10-49)	36%	13%	6%	9%
Large (≥50)	53%	25%	38%	20%

Please note the following number of respondents by category: Small (n=156), Medium (n=157), Large (n= 81)

## Effects of Demographics on ADA Adoption and Use

No significant correlations were found among Individual demographics (e.g., age, gender, position with a firm, years of experience) and the adoption and use of ADAs and tools.

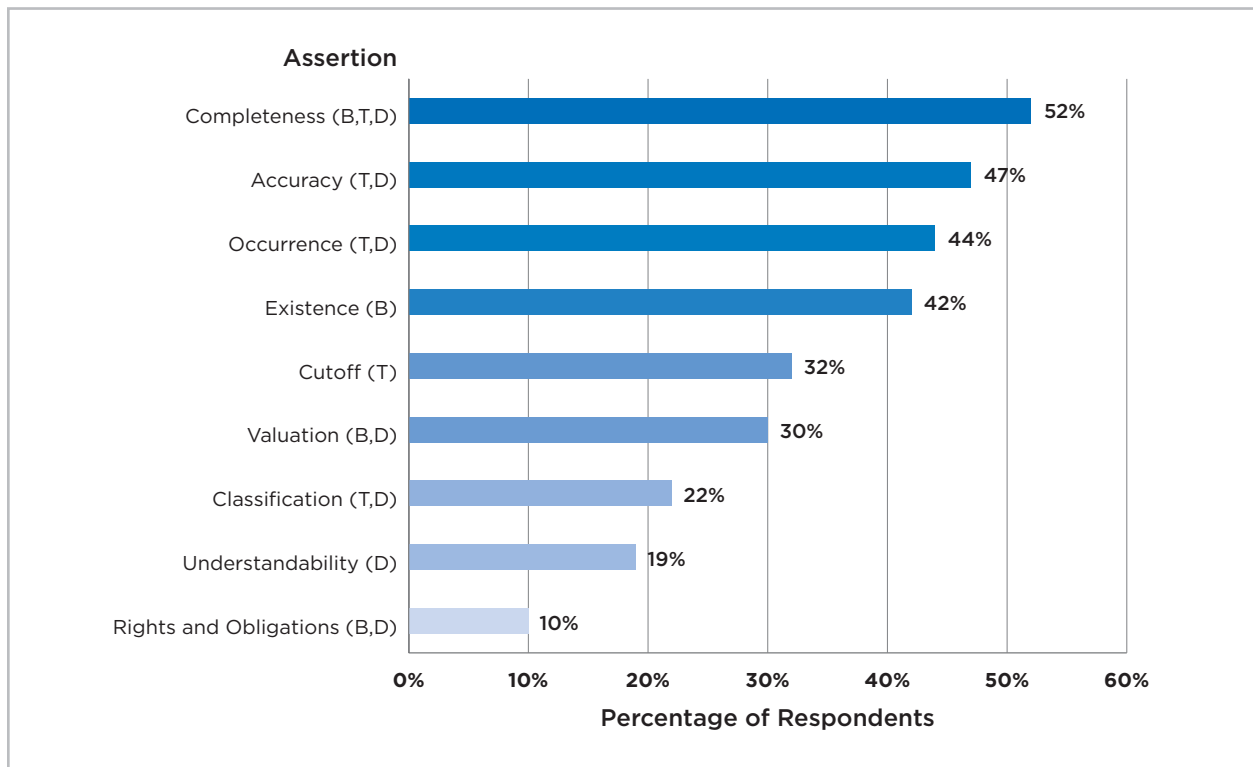
## Use of ADAs for Auditing Assertions

The survey results show that all respondents who used ADAs used them to audit assertions. For the purposes of the Canadian Auditing Standards (CASs), assertions are representations by management, explicit or otherwise, that are embodied in the financial statements, as used by the auditor to consider the different types of potential misstatements that may occur.

As indicated by Exhibit 6, the extent to which ADAs were used varied widely when auditing the various financial statement audit assertions. Overall, there was more use for those assertions that require relatively less judgment and decision-making expertise. For example, 52% of respondents used ADAs to audit the completeness assertion (i.e., whether items are missing from a population) compared to 10% use for the rights and obligations assertion (i.e., whether rights and obligations are appropriately reflected in accounts and disclosures).



## EXHIBIT 6—PERCENTAGE OF RESPONDENTS WHO USED ADAs TO AUDIT EACH ASSERTION



**Legend:** (B) Assertion about account balances at the period end  
(T) Assertion about classes of transactions and events for the period under audit  
(D) Assertions about presentation and disclosure

### Using Results of ADAs as Primary or Corroborative Sources of Audit Evidence

The survey asked respondents to indicate whether they used the results of ADAs as a primary source of audit evidence or as a corroborative source of audit evidence.

Some key findings from this aspect of the survey include those set out in Exhibit 7.

**EXHIBIT 7—USE OF ADAs AS SOURCES OF PRIMARY AND CORROBORATIVE AUDIT EVIDENCE**

Primary and Corroborative Sources of Evidence Provided by ADAs	Respondents from large firms	Respondents from small/medium-sized firms	Respondents auditing large clients	Respondents auditing small/medium clients
A primary source of audit evidence for assertions about classes of transactions	N	Y*	N	Y
A primary source of audit evidence for assertions about account balances	N	Y	N	Y
A corroborative source of audit evidence for assertions about classes of transactions	Y*	Y	Y	Y
A corroborative source of audit evidence for assertions about account balances	Y*	N	Y*	N

Y	significant indication from survey results for use of ADA tools, including Excel-based tools
N	no significant indication from survey results
*	significant indication for use of advanced ADA tools, excluding Excel-based tools

## Survey Results Regarding Factors Driving or Impeding Use of ADAs

### Factors Driving or Impeding Use of ADAs

Respondents were provided with a list of factors that might be driving or impeding the use of ADAs. They could also specify other factors if desired. Using a five-point ranking scale, respondents were asked to respond to statements aimed at obtaining information about these factors. The possible rankings varied from 1 (strongly disagree) to 5 (strongly agree) plus a “don’t know” category.

Examples of statements to which respondents were asked to react included:

- In my office location, a wide range of audit data analytics training opportunities are available for audit staff.
- Using audit data analytics increases the likelihood of issuing the appropriate audit opinion.

- Using audit data analytics is expected by our clients.
- Over the next 3 years, audit data analytics is critical to our competitive strategy.
- Current audit standards facilitate the use of audit data analytics.

**Results Regarding Factors Driving Use of ADAs**

Exhibits 8a and 8b show some relationships that help drive increased use of ADAs. Client expectations represent an external driver of a firm’s ADA use, while strategy to achieve competitive advantage is an internal driver.

As shown in Exhibit 8a, both small and large firms found that, when contemplating external motivation for use of ADAs, client expectations drove ADA use. As shown in Exhibit 8b, when contemplating both external and internal motivation, both client expectations and competitive advantage drove ADA use for small firms. However, for large firms when contemplating both external and internal motivation, only competitive advantage drove use of ADAs. For both Exhibits 8a and 8b, there is a significant positive relationship between use of ADAs and perceived confidence by auditors in their audit opinion. This relationship was found to be stronger for auditors from larger firms.

**EXHIBITS 8A AND 8B—EXAMPLES OF DRIVERS OF INCREASED ADA USE**

EXHIBIT 8A—EXTERNAL MOTIVATORS

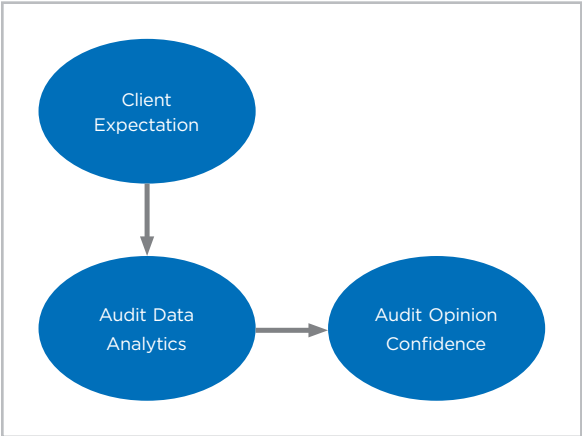
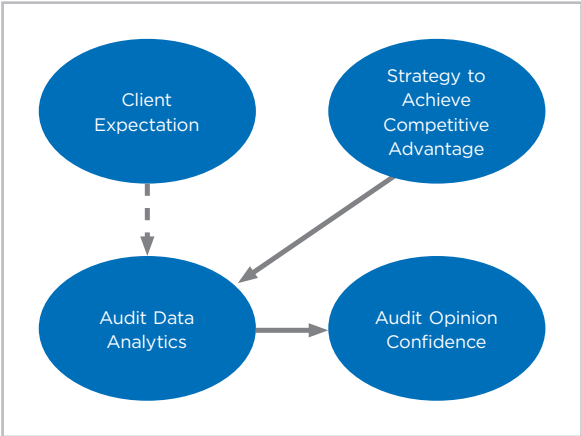


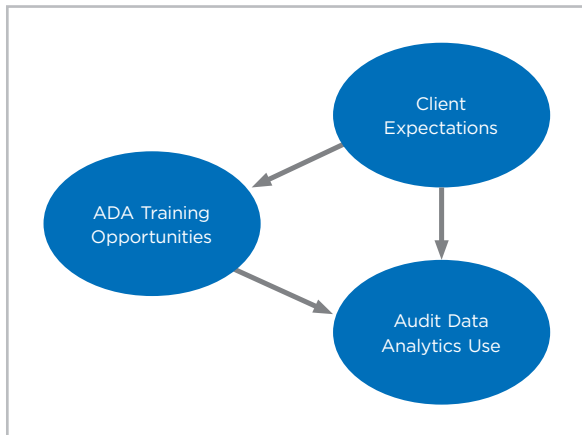
EXHIBIT 8B—EXTERNAL AND INTERNAL MOTIVATORS



Providing training opportunities is a practical response by audit firms who want to meet client expectations regarding use of ADAs.

Survey respondents were asked if using audit data analytics was expected by their clients. As shown in Exhibit 9, the survey found for all sizes of firms that there was a significant positive relationship between client expectations and increased ADA training opportunities leading to increased use of ADAs. However, this relationship was found to be weaker, but still significant, at larger firms.

## EXHIBIT 9—EXAMPLES OF DRIVERS OF INCREASED ADA USE



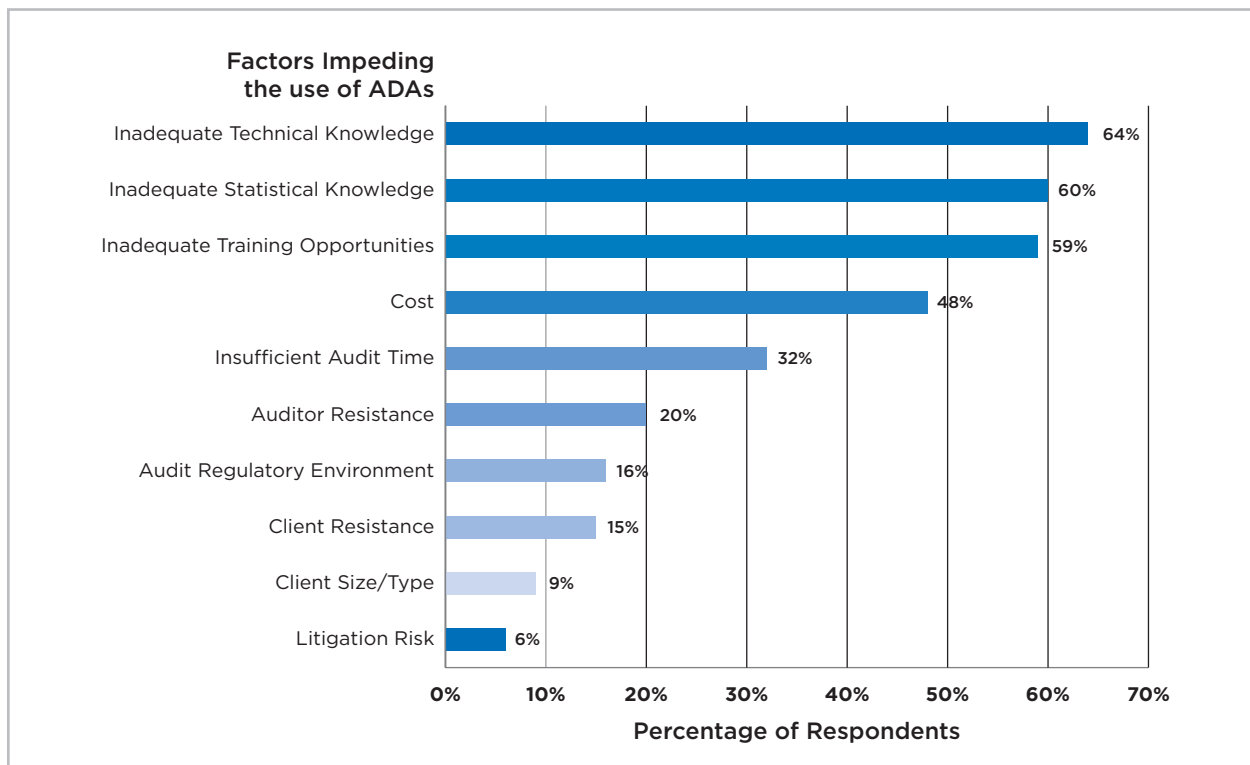
In addition, the survey explored relationships between auditor confidence in their audit opinion and ADA expertise and diversity of ADA tools used. For the purposes of the survey, ADA expertise referred to one or a few individuals in a firm having an expert level of knowledge of one or a small number of ADA tools. ADA tool diversity referred to many (or perhaps all) auditors in a firm having a functional (i.e., non-expert) knowledge of a diverse set of ADA tools. The survey results indicate that for both large firms and small/medium-sized firms, ADA expertise has a significant positive correlation with audit opinion confidence. For small/medium-sized firms, ADA tool diversity also has a significant positive correlation with audit opinion confidence.

### Results Regarding Factors Impeding Use of ADAs

Exhibit 10 shows factors perceived to impede the use of ADAs. The percentage of respondents identifying a particular factor may be an indicator of its relative importance. If that is the case, then inadequate technical knowledge, statistical knowledge, training, cost, and insufficient audit time are the most significant barriers to increased use of ADAs by auditors.

The survey results also show that some auditors are resistant to change and do not have a desire to integrate ADAs into their audits. Finally, there is a relatively strong association between firm size and the regulatory environment as an impediment to further integrating ADAs into the audit of financial statements. The same association is present as the audit engagement size increases.

## EXHIBIT 10—PERCENTAGE OF RESPONDENTS WHO IDENTIFIED THE SPECIFIED FACTOR AS IMPEDING USE OF ADAs



## Possible Implications of Survey Results

### Need for Further Research on Approaches Taken for Using ADAs

The survey indicates that the different approaches taken for auditing assertions vary significantly with firm and audit size (see Exhibit 7). A difference in approach that particularly stands out is that small firms use the results of ADAs as a primary source of audit evidence for some assertions. This is not the case for large firms. There is a need for further research to obtain information on reasons why firms of different sizes are taking different approaches.

### Training in Use of ADAs and Related Tools

As noted above, respondents perceived ADA training opportunities to be inadequate. Improved training could be the key to addressing the top two significant impediments to increased use of ADAs identified by respondents: inadequate technical and statistical knowledge.

Firms vary in the resources they are able to devote to training. As noted above, there are various strategies available that require important decisions on how to best spend limited resources. Faced with having to make a choice, some firms may choose to use a model focused on training a few experts while others might focus on training that would provide all auditors with a working (i.e., non-expert) knowledge of various ADA tools. There are

numerous trade-offs to consider, including various economic factors. However, regardless of the model chosen, well-trained auditors would likely perform audits more effectively and efficiently thus making investments in training in use of ADAs worthwhile.

## Conclusion

CPA Canada, along with professors Hampton and Stratopoulos, are considering what the results of this survey (combined with their research work) may indicate for the future. The professors have further explored and discussed some findings from the survey in a research paper.<sup>3</sup> In their view, firms that manage to stay on top of the current implementation and use of ADAs would be well positioned to exploit the transition to use of ADAs with Big Data, and then move to the next wave of ADAs based on data generated from the Internet of Things.<sup>4,5</sup> Because the audit profession is only in the early stages of mainstream adoption of ADAs, firms are encouraged to act now or risk being left behind with each new wave of emerging technologies.

Some public accounting firms, particularly large firms, are also further exploring increased use of ADAs and related tools. CPA Canada and its Audit Data Analytics Committee are of the view that there is a pressing need for all public accounting firms, regardless of size, to develop and implement a strategy for ADA adoption and use in their financial statement audits. This will likely be a key factor in enhancing the relevance and value of the financial statement audit in a changing environment characterized by ever-increasing use of IT, and in continuing to improve audit quality.

## Additional Resources

- [CPA Canada Audit Data Analytics Committee Landing Page](#)
- CPA Canada Publication—[Audit Client Briefing: Why CFOs Should Support the Use of Data Analytics in the Audit of Their Financial Statements](#)
- CPA Canada Publication—[Audit Data Analytics Alert: Keeping Up with the Pace of Change](#)
- 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](#)

3 Hampton, Clark and Stratopoulos, Theophanis C., Audit Data Analytics Use: An Exploratory Analysis (November 29, 2016). Available at SSRN: <https://ssrn.com/abstract=2877358>

4 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. ([www.gartner.com/it-glossary/big-data](http://www.gartner.com/it-glossary/big-data))

5 The Internet of Things (IoT) is the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment. ([www.gartner.com/it-glossary/?s=Internet+of+Things](http://www.gartner.com/it-glossary/?s=Internet+of+Things))

# CPA Canada Audit Data Analytics Committee Members

CPA Canada expresses its appreciation to the author for developing this *Audit Data Analytics Alert* and to the members of the CPA Canada Audit Data Analytics Committee for their contribution to its preparation.

## Members (as of the date of publication)

**Eric Au, CPA, CA, CBV, CIA, MAcc, BMath**  
Grant Thornton LLP  
Toronto, ON

**Neil Currie, CPA, CA**  
PricewaterhouseCoopers LLP  
Toronto, ON

**Malik Datardina, CPA, CA, CISA**  
Deloitte LLP  
Toronto, ON

**Sarah deGuzman, CPA, CA**  
KPMG LLP  
Toronto, ON

**Nicole Deschamps, CPA, CA**  
Deloitte LLP  
Windsor, ON

**Kam Grewal, CPA, CA, CPA (Colorado)**  
Ernst & Young LLP  
Toronto, ON

**Kieng Iv, CPA, CA, CMA, MAcc**  
Real Matters  
Toronto, ON

**Travis Leppky, FCPA, FCA, CISA**  
BDO Canada LLP  
Winnipeg, MB

**May Leung, CPA, CA, MAcc**  
Deloitte Touche Tohmatsu Limited  
New York, NY

**Theo Stratopoulos, PhD**  
University of Waterloo  
Waterloo, ON

## Author

**Gregory P. Shields, CPA, CA**

## Academic Support

**Clark Hampton, PhD**  
University of South Carolina

## Staff

**Birender Gill, CPA, CA**

**Juli-ann Gorgi, CPA, CA, MAcc**

**Kaylynn Pippo, CPA, CA**

**Mike Wynen, CPA, CA**

## Comments and Questions

Comments and questions on this *Audit Data Analytics Alert*, or suggestions for future Audit Data Analytics publications should be sent to:

**Kaylynn Pippo, CPA, CA**  
*Principal*, Research, Guidance and Support  
Audit & Assurance  
Chartered Professional Accountants of Canada  
277 Wellington Street West  
Toronto ON M5V 3H2  
Email: [kpippo@cpacanada.ca](mailto:kpippo@cpacanada.ca)

**Mike Wynen, CPA, CA**  
*Principal*, Research, Guidance and Support  
Audit & Assurance  
Chartered Professional Accountants of Canada  
277 Wellington Street West  
Toronto ON M5V 3H2  
Email: [mwynen@cpacanada.ca](mailto:mwynen@cpacanada.ca)

# Appendix

## Information Regarding Types of ADAs and Tools Provided to Respondents

1	Visualization and Descriptive Statistics	<p>Descriptive statistics include mean, minimum, maximum, variance, frequency, distribution, etc. Data visualization presents descriptive statistics in a pictorial or graphical format to assist in identifying relationships and patterns.</p> <p>Examples of tools used to generate descriptive statistics, graphs/tabulations (data visualization): Tableau, SAS Visual Analytics, Excel, Alteryx, Qlikview, Qlik-sense, Spotfire, Power BI, Domo, Python, Microsoft SQL, Oracle Database, ACL, IDEA, or firm-specific tools</p>
2	Advanced Statistical Analysis	<p>Use of statistical techniques such as linear and/or logistic regression and cluster analysis</p> <p>Examples of tools used for advanced statistical analysis: SAS Enterprise Miner, SPSS Advanced Statistics, SPSS modeler, R, Python, ACL, IDEA, or firm-specific tools</p>
3	Optimization	<p>Use of statistical and mathematical techniques to make predictions and then suggest decision options to leverage these predictions</p> <p>Examples of tools used for optimization: Excel Solver, Matlab, Gurobi, or firm-specific tools</p>
4	Text Mining	<p>Deriving information from the analysis of text-based data</p> <p>Examples of tools used for text mining: SAS, WordStat, IBM/SPSS, Textalytics, RapidMiner, Python, or firm-specific tools</p>

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