

DATA ANALYTICS FOR CPAs: CRA, INTERNAL AUDIT AND ASSURANCE AUDIT USES



Sunder Gee
Data Analytic Specialist
ZAP Consulting Ltd.

GTA Accountants Network
Donalda Club, Toronto, Ontario
October 23, 2018

AGENDA

- What is data analytics?
 - What it can do
 - Features
- How data analytic software is being used?
 - CRA
 - CPA firms
 - Internal Audit
- The data analytic process
- Continuous Monitoring
- Artificial Intelligence/Machine Learning

WHAT IS DATA ANALYTICS?

- Data analytics is the process of examining data in order to formulate conclusions

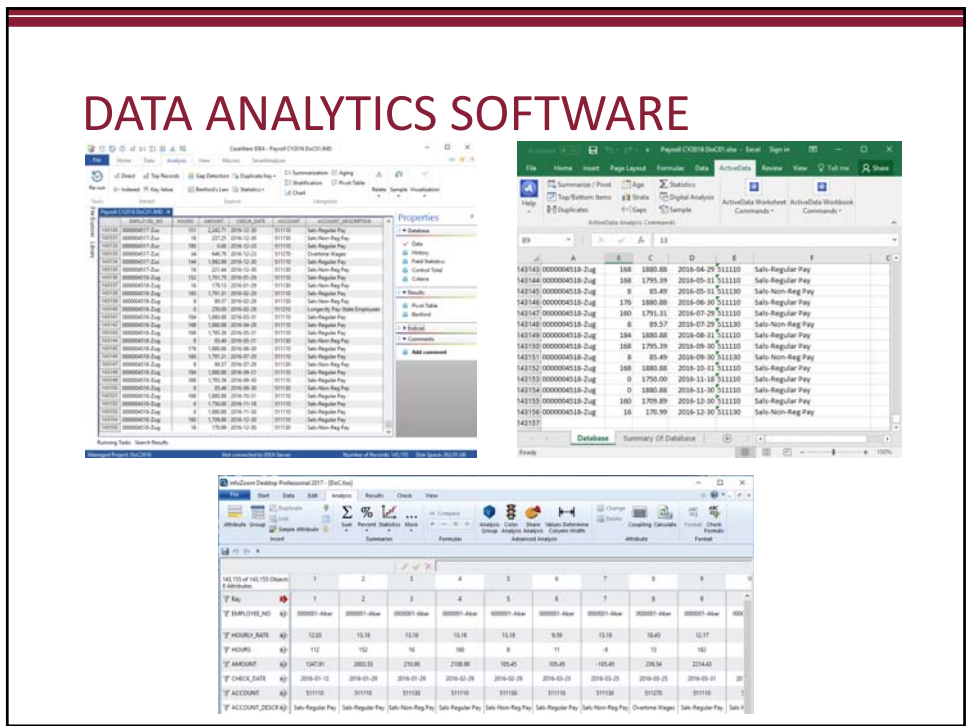
COMMERCIAL DATA ANALYTIC SOFTWARE



CASEWARE



DATA ANALYTICS SOFTWARE



WHAT DATA ANALYTICS CAN DO

- Data analytic software enable users to obtain quick overview of data and can drill down to detail information
- Using data analytic software, every transactions can be involved or touched
- Identify anomalies, trends, patterns and concerns
- Large volumes of data

STANDARD DATA ANALYTIC FEATURES

- Extract
- Sort
- Gaps
- Duplicates
- Aging
- Samples
- Summarize
- Stratify
- Join/Match

STATISTICAL & ADVANCED FEATURES

- Benford's Law
- Trend Analysis
- Time Series Analysis
- Correlation
- Z-Score
- Relative Size Factor
- Same-Same-Same
- Same-Same-Different

WHY YOU MAY NEED DATA ANALYTIC TOOLS

“By using data analytics, auditors are able to discover and analyze patterns, identify anomalies, and obtain other information from relevant data populations that may be very useful to an organization.”

Source: CPA Canada Audit Client Briefing Audit Data Analytics – May 2017

DATA OVERVIEW: FIELD STATISTICS

Numeric Statistics	HOURS	AMOUNT
Max Value	9,050,361	174,749,248.54
Absolute Value	9,263,105	178,721,541.72
# of Records	143,155	143,155
# of Zero Items	12,169	10,929
Positive Value	9,141,728	176,735,395.13
Negative Value	-121,377	-1,986,146.59
# of Positive Records	119,798	121,163
# of Negative Records	11,100	11,067
# of Data Errors	0	0
# of Valid Values	143,155	143,155
Average Value	63.01	1,220.70
Minimum Value	-104	-11,215.91
Maximum Value	816	17,602.93
Record # of Min	38,982	14,288
Record # of Max	3,952	59,003
Sample Std Dev	74.42	1,518.24
Sample Variance	5,538.73	2,305,047.34
Pop Std Dev	74.42	1,518.23
Pop Variance	5,538.69	2,305,031.24
Pop Skewness	0.637404	1.815658
Pop Kurtosis	-0.853161	7.331182

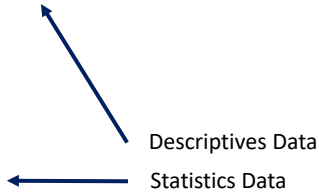
Date Statistics	CHECK_DATE
# of Valid Values	143,155
# of Zero Items	0
# of Records	143,155
# of Data Errors	0
Earliest Date	2015-12-31
Latest Date	2017-01-03
Record # of Earliest	60945
Record # of Latest	4919
Most Common Day	Friday
Most Common Month	January
Items in January	13074
Items in February	12638
Items in March	10565
Items in April	8093
Items in May	12895
Items in June	10818
Items in July	12892
Items in August	11032
Items in September	12046
Items in October	10083
Items in November	13627
Items in December	13272
Items on Sunday	0
Items on Monday	25841
Items on Tuesday	15166
Items on Wednesday	18998
Items on Thursday	21696
Items on Friday	61354
Items on Saturday	0

Character Statistics	ACCOUNT	ACCOUNT_DESCRIPTION	EMPLOYEE_NO
# of Blanks	0	0	0
# of Categories	11	11	2500 +

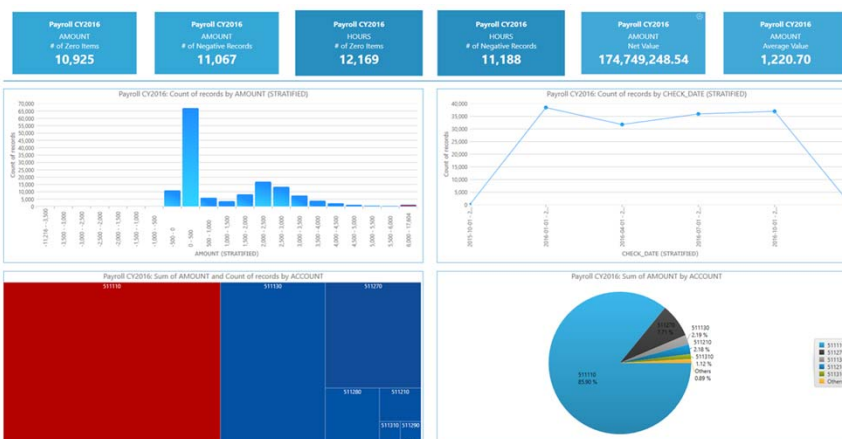
DATA OVERVIEW: DESCRIPTIVES & STATISTICS INFORMATION

Descriptive	EMPLOYEE_NO	HOURS	AMOUNT	CHECK_DATE	ACCOUNT	ACCOUNT_DESCRIPTION
0 NumRecords	143155.0	143155.0	143155.0	143155.0	143155.0	143155.0
1 NumMissing	0.0	0.0	0.0	0.0	0.0	0.0
2 NumNone	0.0	0.0	0.0	0.0	0.0	0.0
3 NumZero	0.0	12169.0	10925.0	0.0	0.0	0.0
4 NumText	143155.0	0.0	0.0	0.0	0.0	143155.0
5 NumNumeric	0.0	143155.0	143155.0	143155.0	143155.0	0.0
6 Median	<N>	16.0	321.95	20160725.0	511110.0	<N>
7 Mean	<N>	63.01	1220.7	20160679.65	511151.65	<N>
8 Mode	<N>	616.0	7760.93	20170103.0	511440.0	<N>
9 Min	<N>	-184.0	-11215.91	20151231.0	511110.0	<N>
10 Variance	<N>	5538.73	2305047.34	144975.91	4340.01	<N>
11 StdDev	<N>	74.42	1518.24	380.76	65.88	<N>
12 Total	<N>	902053.0	17479248.54	2.88610195213e+12	73173914820.0	<N>

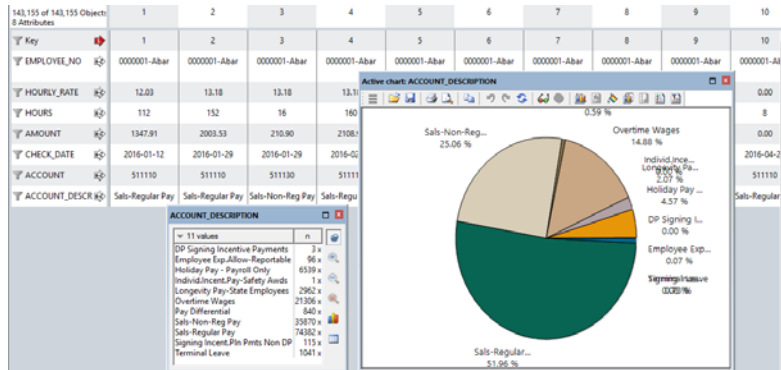
Column Name	HOURS	AMOUNT
NetValue	8,020,352.00	174,749,248.54
TotalPositive	5,141,728.00	176,735,395.13
TotalNegative	-121,377.00	-1,986,146.59
Absolute Value	9,260,100.00	178,721,541.72
Mean	63.01	1,220.70
Median	16.00	321.95
Mode	616.00	7,760.93
PopVariance	5,538.89	2,305,047.34
PopStdDev	74.42	1,518.23
MeanMinus2PopStdDev	-85.83	-1,815.77
MeanMinus3PopStdDev	-211.86	-4,257.28
MeanPlus2PopStdDev	160.26	1,314.02
MeanPlus3PopStdDev	286.28	5,775.41
Minimum	-184.00	-11,215.91
Maximum	616.00	7,760.93
ZeroValueItems	12,169.00	10,925.00
PositiveItems	119,798.00	121,163.00
NegativeItems	11,188.00	11,807.00
TotalItems	143,155.00	143,155.00
BlankItems	0.00	0.00
Errors	0.00	0.00



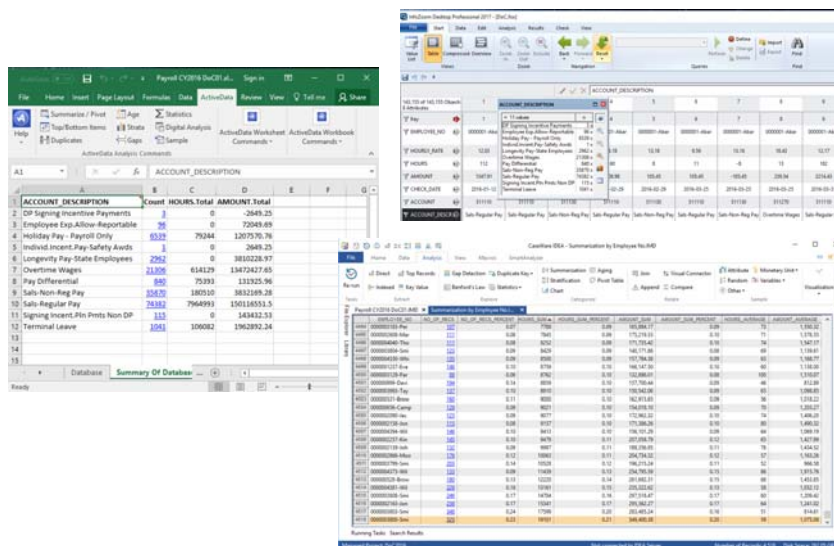
DATA OVERVIEW: VISUALIZATION



DATA OVERVIEW: VISUALIZATION



DATA OVERVIEW: SUMMARIZATION



HOW DA IS BEING USED - CRA

- S. 230 (4.1): Every person required by this section to keep records who does so electronically shall retain them in an electronically readable format
 - IC05-1R1 Electronic Record Keeping
- Electronic Commerce Audit Specialist / Computer Audit Specialist
 - Support Tax and HST/GST Auditors
- Annual Report to Parliament 2014-2015: We continued our point-of-sales initiative with audit teams across Canada to address the use of electronic suppression of sales software to delete or modify sales transactions without maintaining a record of those changes

HOW DA IS BEING USED (ESS) - CRA

- “The first zipper case was detected by CRA in British Columbia (BC) in 2006. This case was discovered by the Vancouver TSO Electronic Commerce Audit Specialists (ECAS) as part of a Computer Audit Assist (CAA).”
- “It was the examination of the original data using the CRA’s Interactive Data Extraction and Analysis (IDEA) software that led to the zipper discovery.”

Source: Electronic Suppression of Sales Phase 1 Report, March 31, 2010 (Redacted)

HOW DA IS BEING USED (ESS)

- On going US sales tax case
- Criminal: Theft and ESS (Class C felony)
- Multiple locations: Receipts not in POS
- Z Report reassessment method
- Data Analytics
 - Data copied from one to another
 - Match all sales fields (Join)
 - Daily sales greater than Z Report
 - Employee login/Sales on days with no Z Reports (Gap)

HOW DA IS BEING USED - CRA

- T20 Report: Must comment on the use made of computer audit techniques during the audit
- The majority of taxpayers maintain a computer-based accounting system and auditors need to be able to analyze the taxpayer's electronic records.
 - Computer-assisted audit techniques (CAATs) are generally used if: the volume of transactions is too large to enable effective and efficient testing

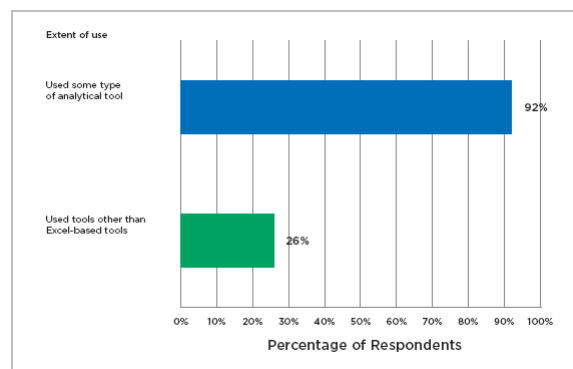
Source: Income Tax Audit Manual - 2015 (Redacted)

13.1.5 PROCEDURES USING COMPUTER-ASSISTED AUDIT TECHNIQUES (CRA)

- Analysis
- Extraction
- Summarization
- Stratification
- Sampling
- Consolidation or joining
- Matching
- Duplicate detection
- Gap detection

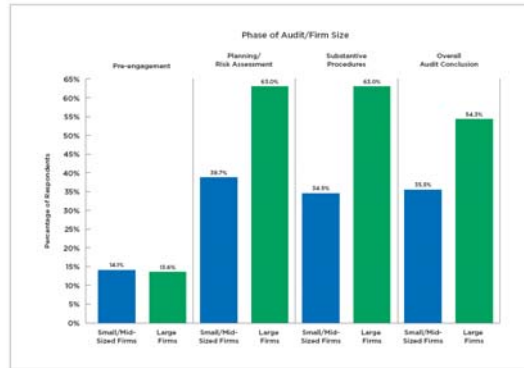
Source: Income Tax Audit Manual - 2015 (Redacted)

EXTENT OF USE OF ADA TOOLS – CPA FIRMS



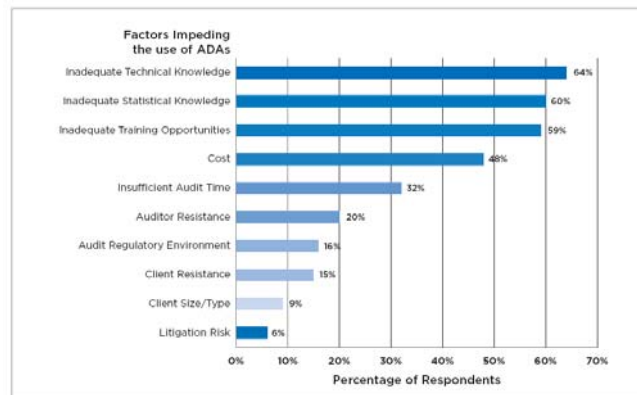
- Survey On Use of Audit Data Analytics in Canada — Results and Possible Implications, CPA Canada September 2017

USE BY AUDIT PHASE – CPA FIRMS



- Survey On Use of Audit Data Analytics in Canada — Results and Possible Implications, CPA Canada September 2017

FACTORS IMPEDING USE OF ADA – CPA FIRMS

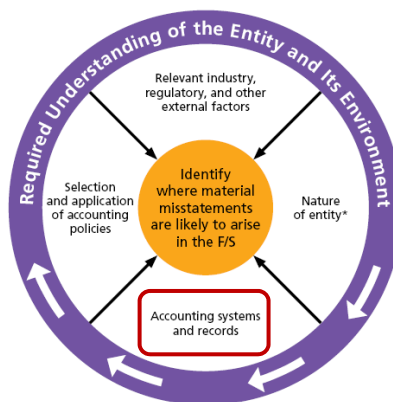


- Survey On Use of Audit Data Analytics in Canada — Results and Possible Implications, CPA Canada September 2017

HOW DA IS BEING USED – CPA FIRMS

- CPA Canada Guide to Review Engagements - Canadian Standard on Review Engagements (CSRE) 2400, Engagements to Review Historical Financial Statements, September 2016
- Issued March 31, 2016, and is effective for reviews of annual and interim financial statements for periods ending on or after December 14, 2017 - harmonize with International Standard on Review Engagements (ISRE 2400)

UNDERSTANDING OF ENTITY AND ENVIRONMENT



Source: CPA Canada Guide to Review Engagements - Canadian Standard on Review Engagements (CSRE) 2400, Engagements to Review Historical Financial Statements, September 2016

HOW DA IS BEING USED – CPA FIRMS

- Analysis
- Calculations
- Gaps & Duplicates
- Exception Tests
- Matching & Comparing
- Sampling

EXAMPLES OF ANALYTICAL PROCEDURES – APPENDIX D

- Cash
- Accounts Receivable
- Short-Term Investments
- Loans and Advances
- Long-Term Investments
- Property, Plant, and Equipment
- Inventory
- Accounts Payable
- Long-Term Debt
- Revenue and Expenses
- Revenue (Comparison of a Predicted Amount to the Recorded Amount in Accounting Records)

Source: CPA Canada Guide to Review Engagements - Canadian Standard on Review Engagements (CSRE) 2400, Engagements to Review Historical Financial Statements, September 2016

AUTOMATED SMARTANALYZER TESTS – CPA FIRMS

Tests included in SmartAnalyzer:

GENERAL LEDGER TESTS		
Test Name	Tagged	Input
Account Balances by Journal Source	No	Optional
Account Balances by Period	No	Optional
Duplicate Journal Entries	No	Not required
Journal Entries by Period	No	Not required
Journal Entries by Period and Journal Source	No	Not required
Journal Entries by User	No	Optional
Journal Entries Posted at Specific Times	No	Required
Journal Entries Posted on Weekends	No	Optional
Journal Entries with Amounts that End in 999	No	Not required
Journal Entries with Large Amounts	No	Optional
Journal Entries with Rounded Amounts	No	Optional
Journal Entries with Specific Comments	No	Optional
Missing Journal Entries	No	Optional
Out of Balance Journal Entries	No	Optional
Summary by Account Combinations	No	Optional
Summary by Account Number	No	Optional

- Journal entries with specific comments
- Account number
- Period of source
- Account balances by source or period

INVENTORY TESTS		
Test Name	Tagged	Input
Aging by Receipt Date and Ending Inventory Balance	No	Required
Aging by Receipt Date and Unit Cost	No	Required
Calculate Inventory Turnover Ratio	No	Optional
Calculate Unit Turnover Ratio	No	Optional
Compare Sales Price with Unit Cost	No	Optional
Duplicate Field Search (Inventory)	No	Required
Inventory Location Summary	No	Not required
Inventory Received Around Specified Date	No	Required
Large Inventory Amounts	No	Optional
Last Sales Price Lower than Unit Cost	No	Not required
Negative Quantity on Hand	No	Not required
Recalculate Inventory Balance	No	Not required
Zero and Negative Unit Cost	No	Not required

ACCOUNTS RECEIVABLE TESTS		
Test Name	Tagged	Input
Aging by due date or invoice date	No	Required
Aging by Invoice Date (Receivables)	No	Required
Accounts with balances or transactions exceeding credit limit	No	Not required
Debtor Transaction Summary	No	Not required
Accounts with credit balances	No	Not required
Debtors with Balances Greater than Credit Limit	No	Not required
Transactions around a date range	No	Not required
Debtors with Net Credit Balances	No	Not required
Duplicate transactions	No	Not required
Debtors with Total Amount Greater than Credit Limit	No	Not required
Duplicate transaction summary	No	Not required
Duplicate Field Search (Receivables)	No	Required
Transactions Around a Specified Date (Receivables)	No	Required

ACCOUNTS PAYABLE TESTS		
Test Name	Tagged	Input
Aging by invoice date	No	Required
Aging by Invoice Date (Payables)	No	Required
Duplicate Invoices	No	Not required
Creditor Transaction Summary	No	Not required
Creditors with net debit balances	No	Not required
Creditors with Balances Greater than Approved Limit	No	Not required
Creditors with total transactions exceeding approved limit	No	Not required
Creditors with Net Debit Balance	No	Not required
Creditors with Total Invoice Amount Greater than Approved Limit	No	Not required
Creditor transactions	No	Not required
Invoices without purchase order numbers	No	Optional
Invoices without purchase order numbers or dates	No	Optional
Duplicate invoices or payments	No	Not required
Invoices without Purchase Order Numbers	No	Optional
Transactions around a specified date (payables)	No	Required
Transactions by user ID	No	Optional
Transactions posted at specified times	No	Required
Transactions posted on specified dates	No	Required
Transactions posted on weekends	No	Optional
Transactions with rounded amounts	No	Optional

FIXED ASSETS TESTS		
Test Name	Tagged	Input
Fixed assets additions	No	Optional
Asset category summary	No	Optional
Asset Category Summary	No	Not required
Depreciation Exceeding Cost	No	Not required
Duplicate Field Search (Fixed Assets)	No	Required
Fixed Assets Additions	No	Required
Recalculate Declining Balance Depreciation	No	Required
Recalculate Straight Line Depreciation	No	Required

Source: Data analytics: The key to Risk-based auditing, CaseWare Analytics

HOW DA IS BEING USED – TATE & TRYON

- During what was thought to be a routine client engagement, Tate & Tryon performed extraction procedures on accounts payable data using DA
- Testing included:
 - A match between a vendor's business address and an employee's home address
 - Total expense reimbursements by employee for the past year
- Tate & Tryon demonstrated that over a six-year period, Sam had embezzled more than \$150,000 USD

Source: How a CPA Firm Used Data Analytics To Uncover Employee Fraud, CaseWare Analytics

HOW DATA ANALYSIS CAN HELP INTERNAL AUDITORS

- Data Analysis can help internal auditors meet their auditing objectives. By analyzing data within key organizational processes, internal audit is able to detect changes or vulnerabilities in organizational processes and potential weaknesses that could expose the organization to undue or unplanned risk.
- By analyzing 100 percent of relevant transactions and comparing data from diverse sources, internal audit can identify instances of fraud, errors, inefficiencies, or noncompliance.

Global Technology Audit Guide (GTAG®) 16
"Data Analysis Technologies" IIA – August 2011

PROTIVITI'S 2017 INTERNAL AUDIT CAPABILITIES AND NEEDS SURVEY

Our Notable Findings:

01

Data analytics is gaining a foothold in internal auditing – Two out of three departments utilize analytics as part of the audit process.

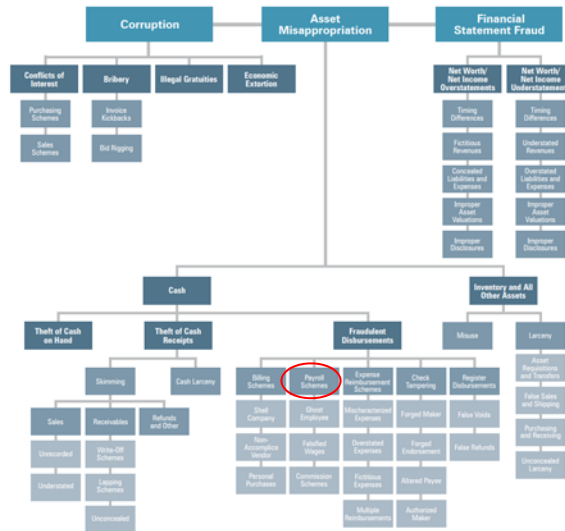
02

Most internal audit shops are still in their "analytics infancy" – A strong majority judge their analytics capabilities to be at the lower end of the maturity spectrum.

03

The more mature analytics capabilities are, the greater value they're perceived to deliver – Organizations with more advanced analytics capabilities in the internal audit department see greater value coming from data analytics.

HOW DA IS BEING USED – INTERNAL AUDIT



Source: Association of Certified Fraud Examiners, Report to the Nations On Occupational Fraud and Abuse, 2016 Global Fraud Study

PAYROLL SCHEME EXAMPLE

- Payroll expense is one of the largest outlay of every organization.
- Due to large amounts and high number of employees, errors and fraudulent payments may be in the system
- Ghost employees and falsified overtime/hours worked

DATA ANALYTICS FOR PAYROLL SCHEME EXAMPLE

- More than one cheque on the same date to the same employee for the same type of salary payments
- Employee receiving Terminal Leave pay more than once
- Employee receiving Regular Pay after Terminal Leave
- Analyse Regular Pay versus Overtime Wages

PAYROLL MASTER FILE TESTS

- Duplicates of employee direct deposit bank information
- Duplicates of employee contact information
- Post office boxes as employee addresses
- Blank fields in employee information
- Frequent address changes
- Employees with no changes in vacation or sick leave balances

PAYROLL MASTER FILE TESTS

- Employees with little or no voluntary deductions for benefits
- Employees with no pay increases or excess increases
- Employee addresses tested against vendor addresses

Source: Gee, Sunder. *Fraud and Fraud Detection: A Data Analytics Approach, + Website*. Hoboken, New Jersey: John Wiley & Sons, Inc., 2014.

PAYROLL REGISTER FILE TESTS

- Payments made outside of starting or ending employment date in payroll master
- Payments made to employees not in payroll master
- Payments to hourly employees not in the time-recording system
- Payments made to employees not in system logs – computer logs, access card entry logs or telephone usage logs

Source: Gee, Sunder. *Fraud and Fraud Detection: A Data Analytics Approach, + Website*. Hoboken, New Jersey: John Wiley & Sons, Inc., 2014.

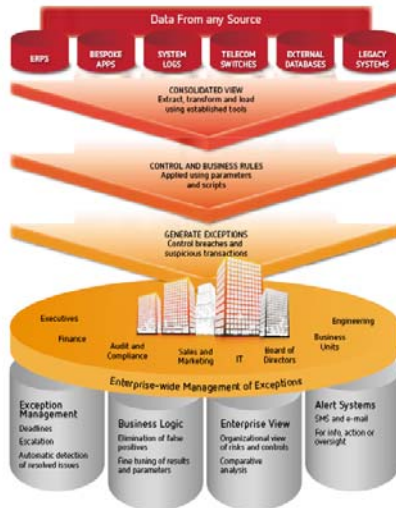
THE PROCESS: PREPARING THE DATA

- Define audit objectives
- Obtain the data
- Verify
- Normalize
- Analyze
- Apply rules/criteria

THE PROCESS: FINDING ANOMALIES

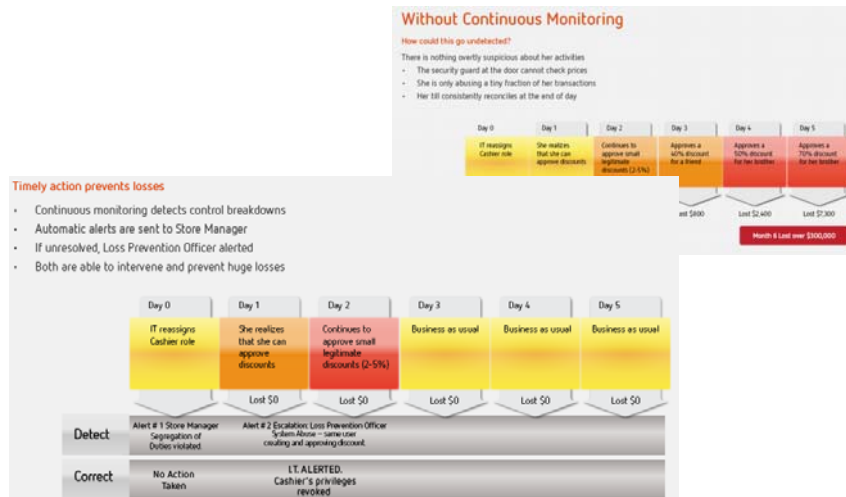
- Resulting anomalies
 - Interpret the data, professional judgement
- Reduce anomalies
 - Additional criteria
 - Cut off
 - Sampling
- Investigate
- Validate
- Report

CONTINUOUS MONITORING



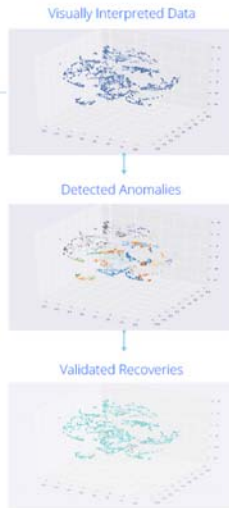
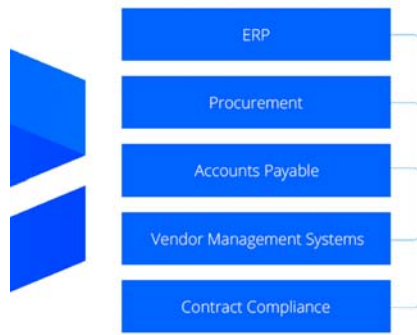
Source: Caseware Monitor, CaseWare RCM Inc.

CONTINUOUS MONITORING - EXAMPLE



Source: Caseware Monitor, CaseWare RCM Inc.

ARTIFICIAL INTELLIGENCE



1.844.402.5272
clara@rtacorp.com
Insights provided by MixalBridge AI

ARTIFICIAL INTELLIGENCE

Analyze / Import data / Status

Hi Sunder!
We're running this file through our analytics. Our in-depth analysis will be ready shortly. If you navigate away from this page we'll notify you when it's ready.

Analyzing and learning...

Detected Normal Journal Entries with Debits and Credits

Analyze / General Ledger Journal - GLTRANS.xlsx - Dashboard

General Ledger Dashboard General Ledger Data Table

High Risk	Medium Risk	Low Risk
\$1.43M	\$15.54M	\$12.72M
7 transactions (2% of the ledger)	284 transactions (71% of the ledger)	1,939 transactions (87% of the ledger)

Risk breakdown by month

Launch Intelligent Sampler

File details

- GLTRANS.xlsx
- Mar 1, 2001 - Feb 28, 2002
- 2,210 transactions
- 11,206 entries
- Sunder Geo

Balances

Debits
\$29,688,161.15

Credits
\$29,688,161.15








Control Point Triggered

18 Expert score

ARTIFICIAL INTELLIGENCE

Control points	Additional details
Transaction: 102	Sort by: Risk (high - low) ▼
Account: 1500	1 digit Benford At least 2 entries in the transaction were well outside the expected pattern.
Account Name: Inventory	Cash expenditures This transaction contains 2 credits to cash or cash-equivalent accounts.
Account Type: Asset → Inventory →	Complex structure Transaction complexity is high and transaction should be examined.
Reference: ML-19-1039	End of Period This transaction has 2 entries posted within 10 days before a fiscal period end.
Source: Payables	High monetary value This transaction contains 3 entries above the top 2% of monetary values within the ledger.
Posted Date: 2007-05-22	Last 3 digits This transaction contains 2 entries with value ending in 0.00 or 9.99.
Subaccount: 1	Manual entry This transaction was entered manually into the accounting software.
	Outlier anomaly Amounts within this transaction are unusual for this ledger, according to machine learning-based anomaly detection.
	Suspicious keyword This transaction contains 2 entries that have suspicious keywords in the memo field: "Transfer".
	Rare flows This transaction contains monetary flows which are unusual for this ledger.
	Flow analysis Monetary flows for accounts in this transaction are unusual.
	Unusual amount This transaction does not have any amounts which are somewhat unusual for the accounts in which they appear.
	Expert score This transaction was not identified as high risk by a domain expert.
	Cash to bad debt conversion This transaction is not involved in conversion from cash to bad debt.
	Complex instrument This transaction has no keywords indicating a complex instrument.
	Duplicate This transaction does not have any duplicates within the ledger.
	Empty text field This transaction has no entries with blank memo fields.
	End of year This transaction does not have entries that were posted within 10 days before any fiscal year end.
	Reporting Adjustment This transaction is not flagged as a reporting adjustment.
	Reversal This transaction does not appear to be a reversal of any transactions.
	Reversed This transaction does not appear to be reversed by any subsequent transaction in the ledger.
	Sequence gap This transaction is not adjacent to a missing transaction.
	Start of period This transaction does not have entries that were posted within 10 days after a fiscal period start.
	Start of year This transaction does not have entries that were posted within 10 days after a fiscal year start.
	Unbalanced debits and credits This transaction's debits and credits balance.
	Weekend post This transaction does not have entries that were posted on a weekend.
	Zero entry All of this transaction's entries contain a debit or a credit value.
	Material value This transaction contains 9 entries with monetary value above the material threshold of \$0.00.

ARTIFICIAL INTELLIGENCE

Completeness Check  This worksheet will help you confirm the completeness of the ledger. To utilize this worksheet you will need access to the trial balances from the previous and current year.	Income Statement  Financial reporting summary covering quarterly periods, year over year showing revenues and expenses through operating and non-operating activities.	Monthly Financial Leverage Ratios  This report includes the following ratios: <ul style="list-style-type: none"> Debt to Equity Ratio Total Debt to Assets Ratio Long-term Debt to Working Capital Ratio Capitalization Ratio
Monthly Liquidity Ratios  This report includes the following ratios: <ul style="list-style-type: none"> Working Capital Ratio Working Capital Amount Quick Ratio 	Monthly Performance Indicators  This report includes the following ratios: <ul style="list-style-type: none"> Total operating revenue Cost of goods sold (COGS) Earnings before interest, tax, depreciation and amortization (EBITDA) Accounts Receivable Total Assets Total Liabilities 	Monthly Profitability Ratios  This report includes the following ratios: <ul style="list-style-type: none"> Net Profit Margin Gross Profit Margin Net Income Return on Investment Return on Equity Return on Assets Cash Turnover
Monthly Sales Ratios  This report includes the following ratios: <ul style="list-style-type: none"> Accounts Receivables over Current Assets Accounts Receivables over Total Assets 		

<http://www.mindbridge.ai/bemike>

SUMMARY

- Opportunities
 - Enhanced audit quality
 - Improved client service
 - Increased effectiveness
- Hurdles
 - Resistance by auditors and firms
 - Increase auditor competencies
 - Difficulty in obtaining usable data
 - Resistance by organizations of having their data accessed by auditors' systems

To help organize data and find the most important elements of any situation, you ask three questions: What do I know? What don't I know? **If I could get more information, what do I need to know?**

Source: Herman, Amy E., *Visual Intelligence*. Boston: Houghton Mifflin Harcourt, 2016.

QUESTIONS ?

Sunder Gee
1-647-367-3567
Sunder.Gee@ZapConsulting.ca

DATA ANALYTICS FOR CPAs: CRA, INTERNAL AUDIT AND ASSURANCE AUDIT USES



Sunder Gee
Data Analytic Specialist
ZAP Consulting Ltd.

GTA Accountants Network
Donalda Club, Toronto, Ontario
October 23, 2018