Data Analysis

San Francisco Chapter of ISACA

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Serving IT Governance Professionals
San Francisco Chapter

Learning Objectives

- **Understand how data analysis can impact/improve business**
- **Understand the data analysis process**
- **Understand typical data analysis challenges**
- **Understand the various CAATs that can be employed in the audit**

Agenda

- **Overview**
- **Leveraging Data Analysis Techniques in the Audit**
- **Business Focus of Data Analysis Procedures**
- **Performing Data Analysis**
- **Data Analysis Challenges Encountered**
- **Continuous Control Monitoring**
- **Using CAATS to Explore the Potential for Fraud**
- **Q & A Discussion**

Overview

What is Data Analytics?

- **Data Analysis is…**
  - Analysis of data to identify anomalies, trends and risk indicators
  - Analysis is based on large population of transactions instead of sample
  - Act of transforming data with the aim of extracting useful information and facilitating the achievement of factual conclusions.

- **In practical terms…**
  - Data analysis is used to supplement or replace other procedures - including inspection, inquiry, observation, and re-performance
  - Coverage over complete populations of data
  - Able to draw on multiple data sources and systems
  - Objective and factual results

Integrating Analytics into the Audit process

Procure-to-Pay Example

Scenario

- Per the 2006 audit plan, Internal Audit was required to conduct a Procure-to-Payment audit at one of the 5 business units within a $20 Billion company
- The objectives of the audit were to identify process and control weaknesses within the payment process, evaluate vendor terms with a view on improving cash flow, and identify opportunities to enhance the process.

Results

- Purchase orders with “Pay Immediately” terms – Identified 1,148 purchase orders with “Pay Immediately” payment terms, resulting in invoices with the value of $44M being paid within 1 day of invoice receipt.
- Invoice payment terms were modified at the request of the business units – Identified 936 invoices with 30-day or 45-day payment terms and a combined value of $46.2M where the payment terms were changed to “Pay Immediately”.
- Checks paid in advance of invoice terms – For January 2005, 23% of invoices ($13M) were paid between 1 to 5 days in advance of payment due date.
- Low incidence of Net 45 or Net 60 purchase order placements – Only 17% of purchase orders are issued with 45-day or 60-day terms.

Opportunity for improvement in Days Payable Outstanding (DPO) by 3 to 7 days with an estimated impact to cash flow of $10M to $16M.

Integrating Analytics into the Audit process

Procurement Card Example

Scenario

- Internal Audit was required to conduct a Procurement card audit at a $2 Billion company
- The objectives of the audit were to identify process and control weaknesses within the P-Card process, identify cash recovery opportunities, and provide insight into major trends and classifications of spending.

Results

- Out of policy/Questionable use – Identified 1000+ ‘high risk/out of policy’ P-Card transactions with a total value exceeding $500K. Analyzed transaction patterns to isolate ‘high risk’ spending to a filtered population of 20 cardholders.
- Transactions after termination – Identified 3,353 transactions totaling $3.6M made by terminated cardholders.
- **Opportunity for improvement in policy compliance/prevention of high risk transactions and creation of a set of KPIs to monitor the efficiency of the P-Card process on an ongoing basis.**

Leveraging Data Analysis Techniques in the Audit

Today's Corporate Landscape

- The unprecedented cost of control and compliance is placing pressure on corporations and auditors to upgrade auditing techniques through technology
- Dramatic improvements are being made in the cost and advancement of technology to monitor business operations and create business intelligence
- The expectation gap is widening on the topic of fraud, as well as the overall role of the financial statement audit
- SOX has resulted in heightened Audit Committee interest in fraud and process/control integrity
- Our ability to provide deeper and more insightful findings will strengthen our world class capability

Challenges - Data Integrity and Process/Control

- Poor integration of systems and processes
- Aging legacy systems
- Rapid implementations
- Management change
- Constantly changing business requirements
- Poor documentation

Using Data Analytics to Address Challenges

- Maximizing enterprise risk coverage
- Building sustainable and repeatable methods of control assessment
- Increasing the focus on fraud detection and monitoring
- Efficient and focused deployment of resource
- Enhancing foundation and expert competencies (Career opportunities)
- Achieve high management satisfaction, tangible business value and develop partnering relationships

Impact of Data Analytics on Audit

- *Broader Audit Coverage* - Audit results are based on a significantly larger population than if the sample-based approach is used.
- *Improved Risk Evaluation* - Improves the risk coverage, quality, and timeliness of the assurance process
- *Ability to Quantify Results* – Ability to easily quantify results in terms of Dollars and Frequency
- *Understanding Root Causes* - Use of analytics facilitates a deeper and broader understating of the issues and root causes.
- *Enables Audit Re-performance* - Analytics are repeatable with minimum effort enabling re-performance at regular intervals
- *Provides a basis for Continuous Monitoring* - Well designed analytics can evolve into continuous monitoring tools

Raising the profile of the audit and providing additional value back to the business

Business Focus
of Data Analysis Procedures

Business Application Focus

- **Data Quality/Application Integrity**
  - Validation of Specific Systems Processes – Transaction, Master or Configuration Data
- **Data Conversion**
  - Corporate Restructuring, Systems Implementation and Conversion
- **Process and Control Optimization**
  - Process Modeling, End to End Validation, Control Validation
- **Forensic Analysis**
  - Fraud, Specific Corporate Initiatives
- **Compliance Evaluation**
  - Contracts, Regulation, Business Expectation & Business Rules
- **Decision Support**
  - General Audit Planning
- **General Audit Enablement/General Analytics Support**
  - Testing, Intelligence, Problem Solving

Business Application Focus – continued

Data Quality/Application Integrity

- **Focus:** Determine whether an application is functioning as intended as specified by business objectives, policies, and/or standard requirements.

- **Examples:**
  - Test for anomalous or missing data field contents of transaction, master, or system configuration data and quantify impact
    - Report missing vendor payment terms and quantify lost discounts using average vendor payment terms
  - Test for failure to meet defined system performance and quantify impact
    - Quantify and report lost vendor discounts

Business Application Focus – continued

Data Conversion

- **Focus:** Test the quality of data conversion process and results, required by system changes or implementation of new systems, often associated with new business combinations.
- **Examples**
  - Test conversion from one data format to another
    - Validate conversion of date field from mm/dd/yy format to mm/dd/yyyy and reporting differences
    - Validate conversion of amount field from numeric format to packed format and reporting differences
  - Test conversion from one system to another
    - Validate conversion of key data elements from old system to new system by comparing and reporting unmatched data
  - Test conversion from one media type to another
    - Validate successful data transfer from one media type to another by comparing record counts and amount control totals

Business Application Focus – continued

Process and Control Optimization

- **Focus:** Determine whether errors, financial waste and losses, potential fraud, and inefficiencies exist in business processes. Identify root causes and recommend solutions.
- **Examples**
  - Payment Stream Analysis – Data may be tested to identify these risks:
    - payments to fictitious/inactive/terminated vendors
    - reprocessing existing invoices resulting in duplicate payments to vendors
    - expense account abuse
    - payments made just under authorization limits
    - repetitive payments under an open PO
    - age unpaid invoices by due date, reporting invoices > specified past due threshold
    - vendor master tests – duplicate vendor name, address, phone, tax id number

Business Application Focus – continued

Process and Control Optimization - continued

- Payroll
  - phantom employees in payroll file
  - payments to terminated employees
  - 401K analysis
  - employees without payroll deductions
  - employee master tests – duplicate vendor name, address, phone, tax id number
  - employees with more than one payroll check in a pay period
- Other processes frequently tested – sales/cash receipts, inventory analyses

Business Application Focus – continued

Forensic Analysis

- **Focus:** Assist with acquiring, interrogating, and processing data to provide evidential matter in response to situations.
- **Examples**
  - Fraud detection - Identify and quantify potential, suspected, or known fraud occurrences in a confidential manner. Analyze transactions initiated, recorded, or authorized by certain individual.
  - Litigation support - Identify and quantify data related to issues in litigation and assist team with identifying and accumulating appropriate evidential matter.
  - Incident response - Provide expertise in rapid data acquisition and report development to present information to management. Perform business diagnostics to identify root causes of an issue and quantify its effect.

Business Application Focus – continued

Compliance Evaluation

- **Focus:** Demonstrate compliance with a regulation, policy, contract or other area.
- **Examples**
  - Test compliance with industry regulatory requirements
  - Test compliance with privacy policies
  - Test compliance with company policies
  - Test compliance with tax regulatory requirements
  - Test compliance with contracts
  - Test compliance with company travel expense policies

Business Application Focus – continued

Decision Support

- **Focus:** Provide information for making and supporting complex strategic operations, business, and financial decisions.
- **Examples**
  - Modeling of Business Case Scenarios
  - Analysis for Mergers, Acquisitions and Business Re-Combinations
  - Data and Survey Tabulation
  - Customer Profiling

Business Application Focus – continued

General Audit Enablement/General Analytics Support

- **Focus:** Provide data analytics to assist with the execution of internal audits and external audits.
- **Examples**
  - Financial audit support – accounts receivable, accounts payable, fixed assets, journal entries, inventory, investments, etc.
  - Operational audit support – purchase to payment process, customer returns testing, warranty reserve valuation process, etc.
  - www.acl.com – Solutions drop down box, Audit and Industries options provide downloadable pdf files with suggested tests to be performed using ACL.
  - Publications sold by ACL, ISACA, IIA, some examples:
    - CAATTs and Other Beasts for Auditors – by David G. Coderre
    - Fraud Toolkit for ACL - – by David G. Coderre

What to look out for?

Process & Controls Analytics

- Audits on transactional processes
- Need to quantify findings
- Account reconciliation challenges
- Reporting errors

Compliance Analytics

- New regulatory requirements
- Concern over integrity of existing compliance process

Fraud Analytics

- Suspect irregularities, fraud, or lack of controls – but need to collect hard evidence
- Internal investigations

Data Quality

- Planning to implement a new IT system or integrate additional IT systems
- Independent verification of data processing

Process & Functional Benchmarking

- Concerns over efficiency of a process or function
- Desire to improve a process or function

Decision Support

- Systems unable to provide relevant information
- Data acquisition challenges
- M&A due diligence

Common Computer Assisted Audit Techniques (CAATs)

Anti money laundering
Base to billing comparison
Billing control verification
Billing systems testing
Cash management
Compliance testing
Credit risk assessment
Customer depreciation
Data warehousing
Debt collection
Forensics
Fraud management
General Ledger Analysis
Government levies recalculations
Insurance claims analysis
Interest recalculation
Inventory analysis
Loan & credit analysis
Premiums provisioning
Price optimization
Re-insurance
Remediation assurance
Revenue assurance
Supply chain
Transaction verification
Validation of credit scoring

Performing Data Analysis

Data Analysis Service Approach

- **The Five Phases**
  - Phase 1: Co-Develop Expectations
  - Phase 2: Acquire the Data
  - Phase 3: Assess the Data
  - Phase 4: Perform Analysis
  - Phase 5: Communicate and Deliver Results

Phase 1: Co-Develop Expectations

- Understand Analysis Situation and Needs
- Identify Available Data Sources
- Define the Solution
- Set the Application Objectives

Phase 1: Co-Develop Expectations (cont.)

- **Understand Analysis Situation and Needs**
  - To provide audit assurance.
  - To evaluate business processes.
  - To identify process improvement opportunities.
  - To investigate issues of specific concern to management.

Phase 1: Co-Develop Expectations (cont.)

- **Identify Available Data Sources**
  - Financial systems, operations systems, data warehouses, knowledge management resources.
  - Company business partners (banks, brokers)
  - Third party information vendors (govt agencies)

Phase 1: Co-Develop Expectations (cont.)

- **Define the Solution**
  - Objectives
  - Scope
  - Required Data Elements
  - Deliverables
  - Timing

Phase 1: Co-Develop Expectations (cont.)

- **Set the Application Objectives**
  - List specific objectives that will produce requested output and will provide a basis for forming conclusions

Phase 2: Acquire the Data

- Develop the Acquisition Plan – Determine Data Location, Quantity of Data, and Data Transfer Issues
- Prepare the Data Request (Consider obtaining test data)
- Receive and Validate the Data
- Prepare the Data for Assessment and Analysis – Data Definition

Phase 2: Acquire the Data (cont.)

- **Develop the Acquisition Plan – Determine Data Location, Quantity of Data, and Data Transfer Issues**
  - Data Location – Where is the data? Can be spread out on multiple platforms, in multiple locations.
  - Quantity – How much data is there? Will influence how data is acquired and processed.
  - Transfer Issues – What are the transfer issues? Media, file format, file sizes must be evaluated. Consider using test data to save time and costs.

Phase 2: Acquire the Data (cont.)

- **Prepare the Data Request (Consider obtaining test data)**
  - Request data file(s), file layouts, control totals.
  - Prepare the data request letter

Phase 2: Acquire the Data (cont.)

- **Receive and Validate the Data**
  - Determine the data is in a readable format.
  - Determine what was received was actually what was requested.
  - Define the fields necessary to tie to control totals.
  - Recalculate control totals. Control totals help determine that the data received is complete and accurate and for the correct time period. Resolve any discrepancies.

Phase 2: Acquire the Data (cont.)

- **Prepare the Data for Assessment and Analysis – Data Definition**
  - Define the data fields.
  - Create computed fields and define coded fields.
  - Format date fields and numeric fields.
  - Determine that all fields requested are present.

Phase 3: Assess the Data

- Design Assessment Tests to Interrogate Data Content and Integrity
- Perform Data Assessment Tests
- Evaluate and Document Assessment Test Results and Findings
- Communicate Results and Findings

Phase 3: Assess the Data (cont.)

- **Design Assessment Tests to Interrogate Data Content and Integrity**
  - Assessment tests should be focused and quick.
  - Focus on critical fields.
  - Stratifications, aggregations, sequence duplicate / gap analyses, format verifications, record counts, control totals, missing data, invalid data, etc.

Phase 3: Assess the Data (cont.)

- **Perform Data Assessment Tests**
  - Execute commands to perform the data assessment tests.
  - Can do this interactively or with scripts.

Phase 3: Assess the Data (cont.)

- **Evaluate and Document Assessment Test Results and Findings**
  - Do the assessment test results indicate any problems with the data?
  - If all findings are satisfactory, proceed with processing.
  - Follow-up with the IT professional who prepared the data to resolve any questions or discrepancies in the data received. If necessary, obtain replacement data.
  - This step is critical to success and economics of the application.

Phase 3: Assess the Data (cont.)

- **Communicate Results and Findings**
- **As assessment tests are completed, evaluate and document findings.**

  - All assessment findings must be confirmed with IT professional and end user, before performing the data analyses.

Phase 4: Perform Analysis

- Design and Develop Analysis Procedures
- Generate Analysis Results
- Evaluate Results
- Prepare Analysis Deliverables

Phase 4: Perform Analysis (cont.)

- **Design and Develop Analysis Procedures**
  - Prepare scripts to perform procedures that satisfy application objectives.
  - Reconfirm the solution and priorities, as expectations and needs may have changed.

Phase 4: Perform Analysis (cont.)

- **Generate Analysis Results**
  - Prepare LOG files that document processing performed.
  - Prepare deliverables as specified in the solution.

Phase 4: Perform Analysis (cont.)

- **Evaluate Results**
  - Probe and evaluate results. Do they make sense; are they reasonable?
  - Investigate the accuracy, completeness, and integrity of results, by comparing results to expectations and cross-referencing other information sources to assess reasonableness of the results.
  - Obtain budget approval to perform additional tests if results warrant further investigation.

Phase 4: Perform Analysis

- **Prepare Analysis Deliverables**

  - Deliverables should be prepared in accordance with the solution defined at the beginning of the process.

Phase 5: Communicate and Deliver Results

- Document the Application and Prepare the Workpapers
- Supervisor Review of the Application Results and Workpapers
- Deliver Analysis Results

Phase 5: Communicate and Deliver Results (cont.)

- **Document the Application and Prepare the Workpapers**
  - Objectives of application
  - Inputs and Files – File layouts, control totals, record counts, how obtained files, data capture information
  - Processing – Files used, processing logic, control totals
  - Output – Processing logs, reports, exported files
  - Other – Reconciliations, correspondence, special instructions

Phase 5: Communicate and Deliver Results (cont.)

- **Supervisor Review of the Application Results and Workpapers**
  - Tie input definitions to file layouts.
  - Tie in control totals.
  - Challenge IF statements.
  - Trace run-to-run record counts and control totals.
  - Challenge date / time stamps of logs and reports.
  - Successful completion of commands – no errors or aborts in log file.
  - Review reports for reasonableness.

Phase 5: Communicate and Deliver Results (cont.)

- **Deliver Analysis Results**
  - Print output or mail electronic output.
  - Confirm with the end user that the output satisfies their objectives.
  - Complete workpapers.

Popular Audit Analytics Tools & Technologies

<table>
<tr><td colspan="2"><u>General Purpose</u>
ACL, SAS, Microsoft SQL Server / Oracle, Microsoft Excel / Access</td></tr>
<tr><td><u>Data Acquisition</u>
• Data Junction
• DataFlux
• Monarch
• INCLUDIS (ERP SAP)</td><td><u>Analysis</u>
• Tableau
• Cognos, Proclarity, Oracle, Speedware (MDA)
• Unstructured Data Analysis Tools</td></tr>
<tr><td><u>Reporting</u>
• Business Objects Crystal Reports & Xcelsius
• Microsoft Analysis / Reporting Services</td><td></td></tr>
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Data Analysis Challenges Encountered

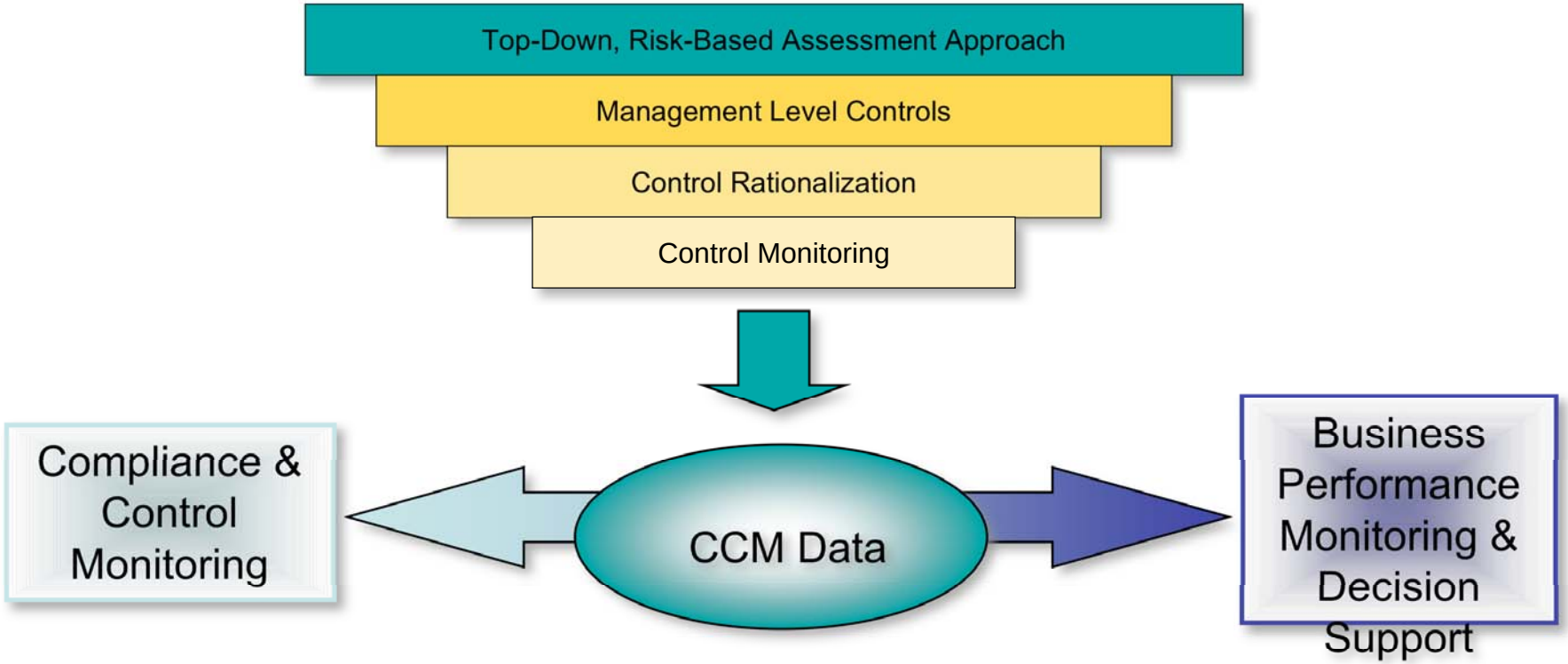
Where companies have been challenged

- Training & Competency Development
- Staff Continuity
- Data Acquisition
- Implementation Strategy
- Conclusions / Output
- Effort vs. Value

An analytics strategy with well organized deployment plan will increase the likelihood of success

Continuous Control Monitoring

What Is Continuous Control Monitoring (CCM)?



Using CAATs to Explore the Potential for Fraud

WHAT IS FRAUD?

Fraud =
Errors/Omissions/Irregularities?

Intent

Types of Occupational Fraud

- Fraudulent financial reporting
- Misappropriation of assets
- Corruption

Typical Financial Statement Fraud Schemes

- Overstated assets
- Understated or unrecorded liabilities
- Improper revenue recognition
- Misleading or omitted disclosures

Typical Revenue Recognition Fraud Schemes

- Recognizing revenue in improper period
- Transactions that do not meet revenue-recognition criteria
- Recording fictitious sales
- Sales contingencies not disclosed to management
- Use of side agreements
- False sales agreements and documentation
- Channel stuffing
- Related-party transactions not disclosed or properly accounted for
- “Round trip” transactions

Fraudulent Journal Entries

Management can use journal entries to:

- Mask diversion of funds
- Record topside adjustments that improperly increase revenue
- Adjust segment reporting
- Reverse purchase accounting reserves
- Write off uncollectible accounts receivable to purchase accounting and intercompany accounts, thereby not reducing income
- Understate payables by recording post-closing journal entries to increase various revenue accounts
- Decrease accounts payable and general and administrative expenses
- Capitalize costs as fixed assets or construction in progress, instead of expensing those costs as incurred
- Record adjustments to allowances

Procedures to Address Risk of Management Override of Controls

- Risk of management override is difficult to assess because of its unpredictability and thus is presumed to be present

- Three required procedures:
  - Review and test journal entries and other adjustments
  - Review significant estimates for evidence of management bias
  - Understand and evaluate the business rationale for significant unusual transactions outside of the normal course of business

- Perform procedures to address each requirement

Non-Standard Journal Entry Review Objective

- Non-Standard journal entries are not subject to the same level of controls as system generated journal entries and pose an increased risk of error or fraud.

- Data Analytics can be used as an enabler in the search and identification of non-standard journal entries.

Definition of Non-Standard Journal Entry

"Anything that requires human intervention"

What is a JE CAAT?

A series of pre-defined data analytic programmed procedures designed to extract and identify anomalies in system or manual journal entries over a given period of time – usually quarterly or annually.

JE CAAT Benefits

- Allows for the complete review of detail journal entries by analyzing the general ledger transaction file to identify any significant postings from unusual sources, unusual amounts, unusual account combinations or entries created for the augmentation of the financial statements, etc.

- Identification of unusual items that may not be identified through the normal course of internal or external audit procedures.

JE CAAT Input Files

- Transaction Level Journal Entry Data File (All Entries)
- Trial Balance
- Chart of Accounts – Balance Sheet and Income Statement Accounts

Transaction Level Journal Entry Data File

- **JE File Field Requirements:**
  - Company
  - Journal Entry Number
  - Journal Entry Description
  - Effective Date
  - Enter Date
  - Account Number
  - Transaction Amount
  - Preparer ID
  - Approver ID
  - Journal Source
  - Other Supporting Fields

General Ledger Trial Balance Data File

- Field Requirements:
  - Company
  - Account Number
  - Account Name
  - Account Type *
  - Account Class *
  - Beginning Balance
  - Ending Balance

  * May be supplied on chart of accounts file or as logic to define fields.

Chart of Accounts Data File

- Field Requirements:
  - Company
  - Account Number
  - Account Name
  - Account Type *
  - Account Class *

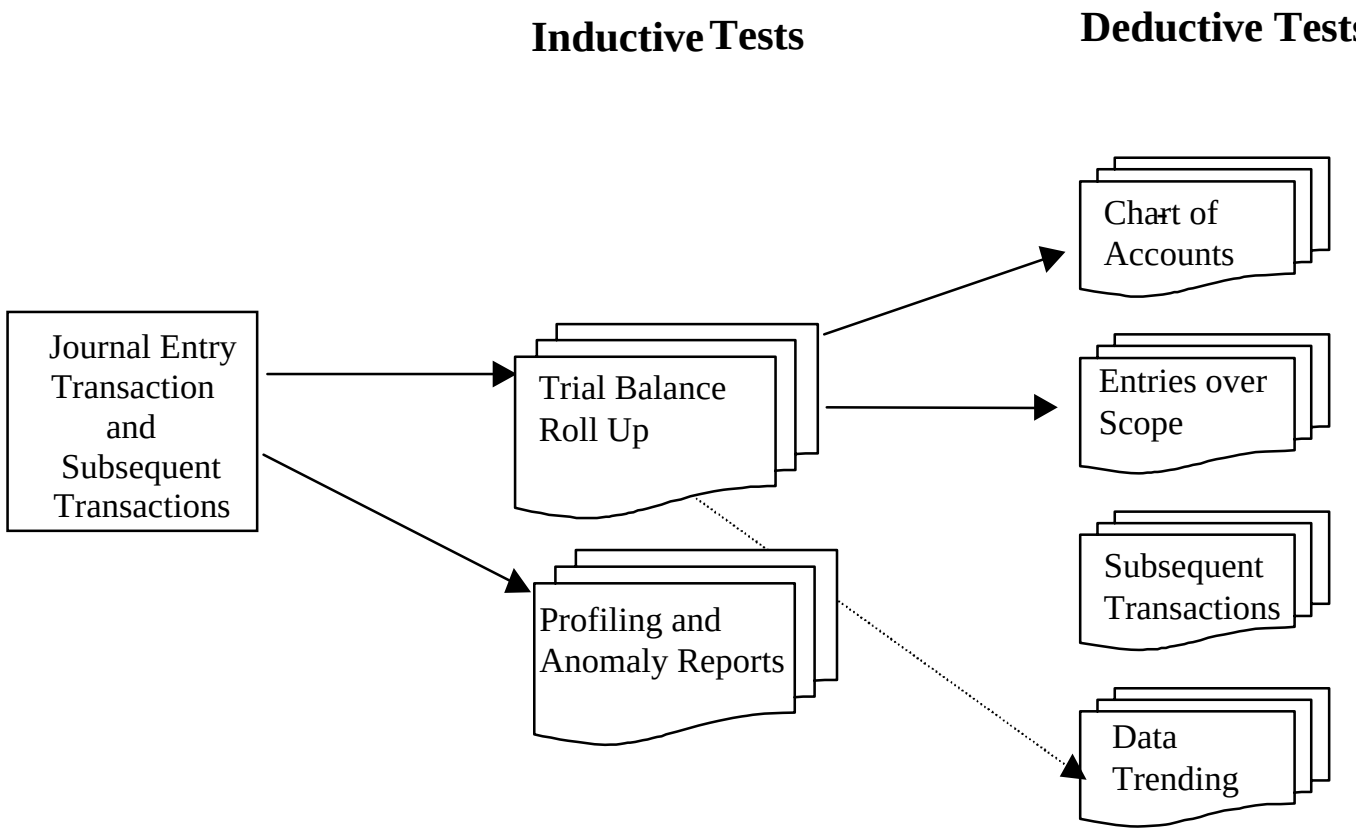
  * May be supplied on chart of accounts file or as logic to define fields.

JE CAAT Business Rules

- Identification of offsetting debits and credits (i.e., Journal ID + Effective Date fields)

- Definition of Non-Standard versus Standard (i.e. Journal Source)

JE CAAT Testing Procedures



JE CAAT Testing Procedures

- **Data Completeness**
  - Trial Balance Roll-Up

- **Data Anomaly Tests**
  - Blank Date Fields
  - Zero Dollar Items
  - Blank Account Numbers
  - Unbalanced Journal Entries
  - Blank Transaction Description
  - Blank Preparer ID
  - Blank Journal ID

JE CAAT Testing Procedures

- **Key JE Transaction Tests**
  - Accounts not in the chart of accounts
  - Line items greater than the absolute value of a dollar threshold
  - Date sensitive journal entries greater than the absolute value of a dollar threshold
  - Line items with duplicate absolute value of dollar amount greater than threshold
  - Unusual account pairings
  - Key phrases in description fields
  - Aggregations by coded fields, dates
  - Random sample

JE CAAT Testing Procedures

– **Data Trending**

- Cross tabulation of key data fields

	Jan	Feb	Mar	Apr	May	Jun
10000	100,000	50,000	5,000,000	75,000	90,000	110,000
10010	200,000	250,000	500,000	475,000	690,000	810,000
10020	200,000	250,000	500,000	475,000	690,000	810,000
10030	1,200,000	1,250,000	500,000	1,475,000	1,690,000	1,810,000

Other Fraud Related Data Analytic Procedures

- Vendor Master File Analysis
- Employee Master File Analysis
- Invoice Tests

Vendor Master File Analysis

- Phantom Vendors in the Accounts Payable File
- Duplicate Vendor and Employee Information
- Payments to Terminated Vendors
- Missing Vendor Information

Employee Master File Analysis

- Deceased Social Security Analysis
- Duplicate Employee Last and/or First Names
- Phantom Employees in Payroll File
- Payments to Terminated Employees
- Questionable 401K Analysis
- Employees without Payroll Deductions

Invoice Analysis

- Duplicate Payment Analysis
- Questionable Invoice Numbers
- Largest Vendors

Q&A