

Using Computer-Assisted Auditing Techniques to Detect



Using CAATs to Find Fraud

- ◆ What are CAATs?
- ◆ Data Analysis Methodology
- ◆ What is Data Mining?
- ◆ Fraud Detection
- ◆ Data Analysis Software & Techniques
- ◆ Examples of Fraud
- ◆ A Generic Approach
- ◆ Benford's Law
- ◆ Financial Crime Investigator
- ◆ Case Studies

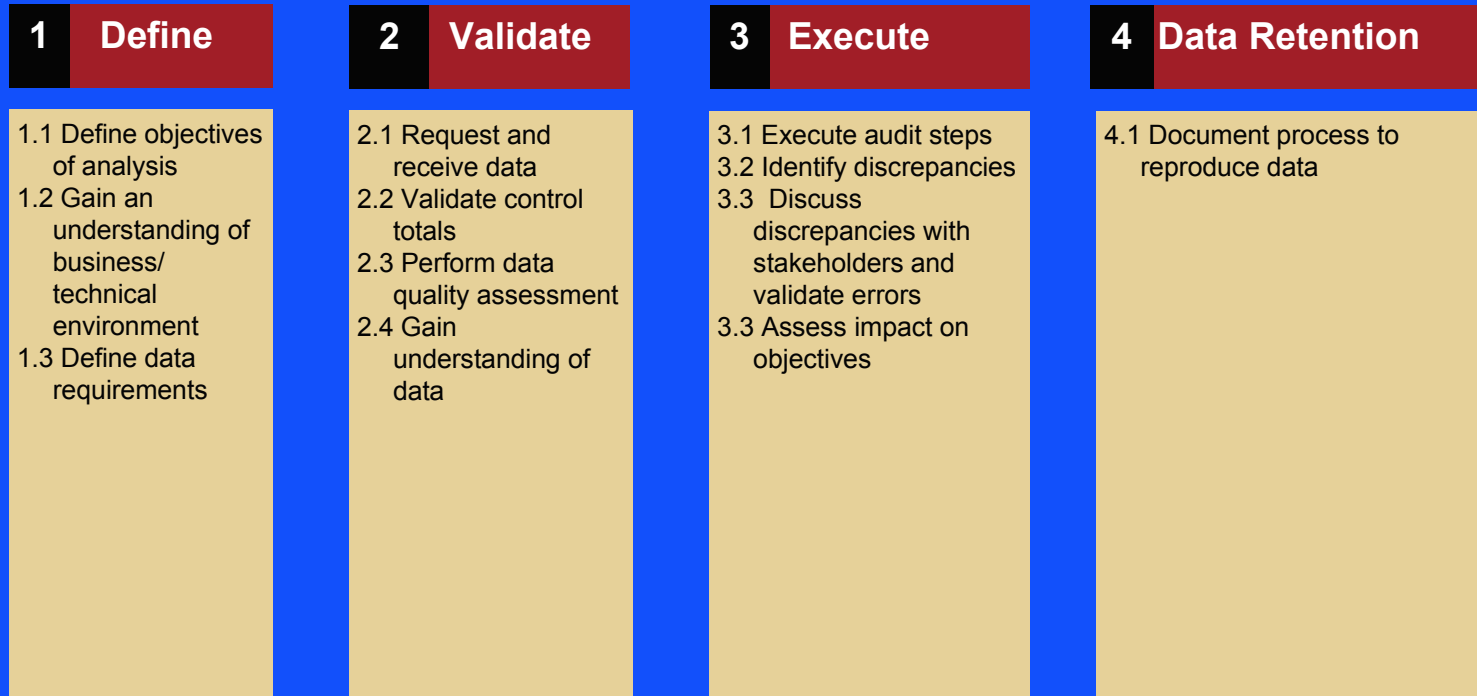
What Are CAATs?

- ◆ Computer-based tools that permit auditors to increase their personal productivity as well as that of the audit function. [*CAATTs & Other BEASTS for Auditors*, by David G. Coderre; 1998, Global Audit Publications]
- ◆ Provides, at a minimum, the following benefits:
 - Gain insight into the business and operations
 - Visibility into the company's control (failure, operations metrics, improvements)
 - Benchmarking across business units, competitors, etc.
 - Testing efficiencies – increase test coverage and assurance
 - Regulatory compliance, fraud or litigation analysis
 - Saves time (sometimes even in the first year)

What Are CAATs?

- ◆ ***The data tells the story!*** Enables you to quantify the financial impact of business decisions, accounting practices, and internal controls
- ◆ Also known as “**Data Analysis**”
- ◆ The power of CAATs: The Georgia Department of Redundancy Department has 135,000 employees. How long would it take auditors to manually search payroll records to identify duplicate payments by finding duplicate social security numbers?

Data Analysis Methodology



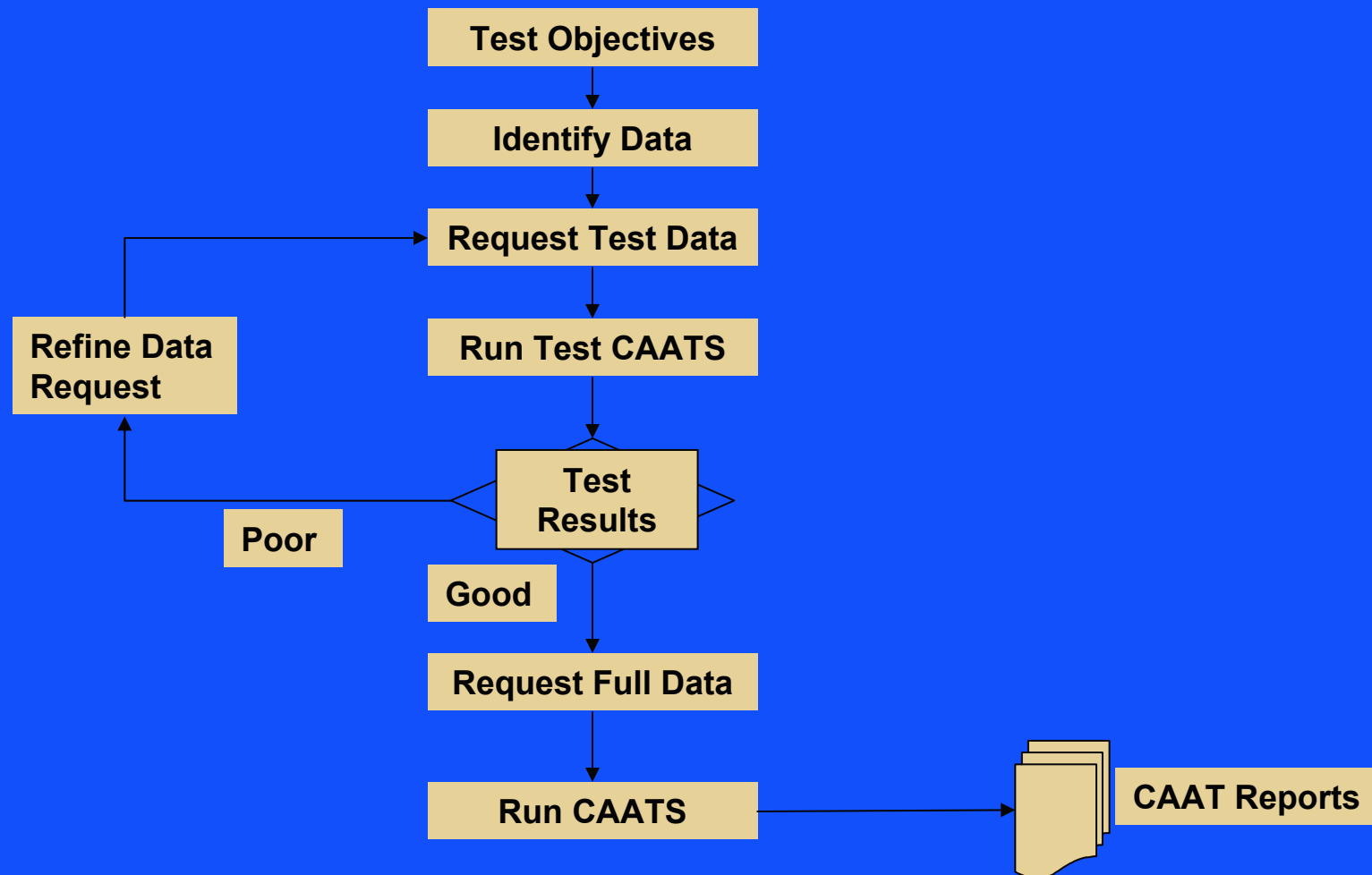
Types of CAATs

- ◆ Word processing
- ◆ Spreadsheet
- ◆ Database
- ◆ Statistical sampling
- ◆ Data mining
- ◆ Real time testing programs
- ◆ Integrated audit software
- ◆ Data analysis
- ◆ Artificial intelligence/expert systems

Types of CAATs Most Important for Fraud Detection

- ◆ Word processing
- ◆ Spreadsheet
- ◆ Database
- ◆ Statistical sampling
- ◆ Data mining
- ◆ Real time testing programs
- ◆ Integrated audit software
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- ◆ Artificial intelligence/expert systems

Using Data Analysis Software



What is Data Mining?

- ◆ The process of discovering meaningful new correlations, patterns, and trends by sifting through large amounts of data stored in repositories, using pattern recognition technologies as well as statistical and pattern recognition techniques [Gartner Group Interactive: <http://gartner6.gartnerweb.com>]
- ◆ Most often used (up until recently) in marketing and customer analysis

Data Mining in Crime Solving

- ◆ Software compiles facts, attributes, and characteristics about various types of crimes
- ◆ Helps investigators identify crimes with common (or similar) attributes/characteristics
- ◆ Linking evidence from similar crimes can lead to identification of perpetrator(s)
- ◆ Detective Toolkit (Violent/Serial Crime)
- ◆ Fraud Investigator (Insurance fraud)
- ◆ Similarity Search Engine (compares any databases)

Data Mining Crime Solving Example

- ◆ Insurance companies compile data on claims: incident descriptions, claimants, witnesses, other individuals involved, time of day, location, etc.
- ◆ Data mining software identified cases where the same individual was involved in several claims, sometimes as witness, sometimes as passenger, sometimes as driver
- ◆ Further comparisons and investigation lead to identification of hundreds of fraudulent claims

Data Mining Crime Solving Example

- ◆ A series of murders occurred with remarkable regularity (weekly) in a small town in Maine
- ◆ Police used data mining techniques to track the similarities and common characteristics of all of these crimes
- ◆ They found that every crime had a single common characteristic; one person was involved in some way with every one of the murders
- ◆ Although they were unable to prove that this person had committed the crime, Cabot Cove declared Jessica Fletcher a public menace, banned her from the town, and the murders stopped

Getting Data

Never!
Never!
Never!
Never!
Give Up!



Winston Churchill

Fraud Detection



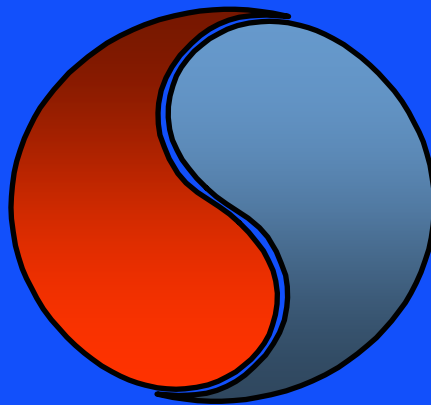
Fraud Detection

- ◆ Think “outside the box” ... “one plus one equals two” is not always [*Fraud Examination in the Classroom*, by Mary-Jo Kranacher, May / June 2005, **FraudMagazine**]
- ◆ Batman once said, “If only they would use their genius for good instead of evil!”

What is Fraud?

Employee Fraud

Activity to benefit himself and affect the company



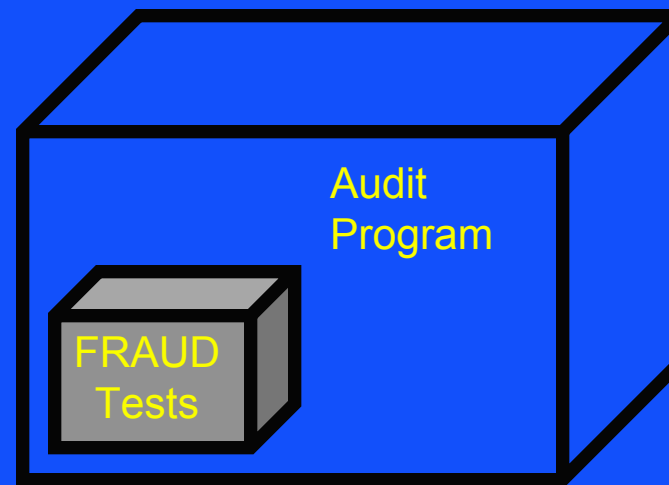
Management Fraud

Activity to benefit the company



Fraud Tests

- Asset misappropriation
- Fraudulent Statements
- Corruption



Fraud Detection Plan

- ◆ Hypothesis Testing
 - Develop a fraud hypothesis
 - Obtain data
 - Design CAAT tests
 - Analyze results to determine if there is support for fraud hypothesis

How Can We Use Data Mining to Find Financial Statement Fraud?

- ◆ Compile databases of key ratios, industry characteristics, and other attributes (risk factors) of discovered financial statement frauds
- ◆ Use data mining techniques to calculate coefficients of correlation between known financial statement fraud schemes and the organization you are planning to audit
- ◆ Results imply the degree of audit risk (and have corresponding implications about audit fees)
- ◆ Better still, results will pinpoint the areas within the financial statements needing the greatest audit attention
- ◆ In effect, a more sophisticated type of analytical procedure than we have done traditionally

Data Analysis Software

- ◆ Useful for identifying misappropriation of assets *and* fraudulent financial reporting
- ◆ Allows limitless number of analytical relationships to be assessed
 - within large databases
 - comparing large databases
- ◆ Identifies anomalies
- ◆ Further (human) investigation is almost always needed

Data Analysis Software

- ◆ Access and Excel
- ◆ Interactive Data Extraction and Analysis (IDEA)
- ◆ Audit Command Language (ACL)
- ◆ Windows based and user friendly
- ◆ Require creativity and imagination
- ◆ Supplements – but does not replace – intelligent audit work

Data Analysis Techniques

Filters

Sorts

Statistics

Gaps

Duplicates

Aging

Confirmations

Samples

Classification

Summarization

Stratification

Join and Define Relationships
















Trend Analysis

Regression Analysis

Parallel Simulation

Digital Analysis

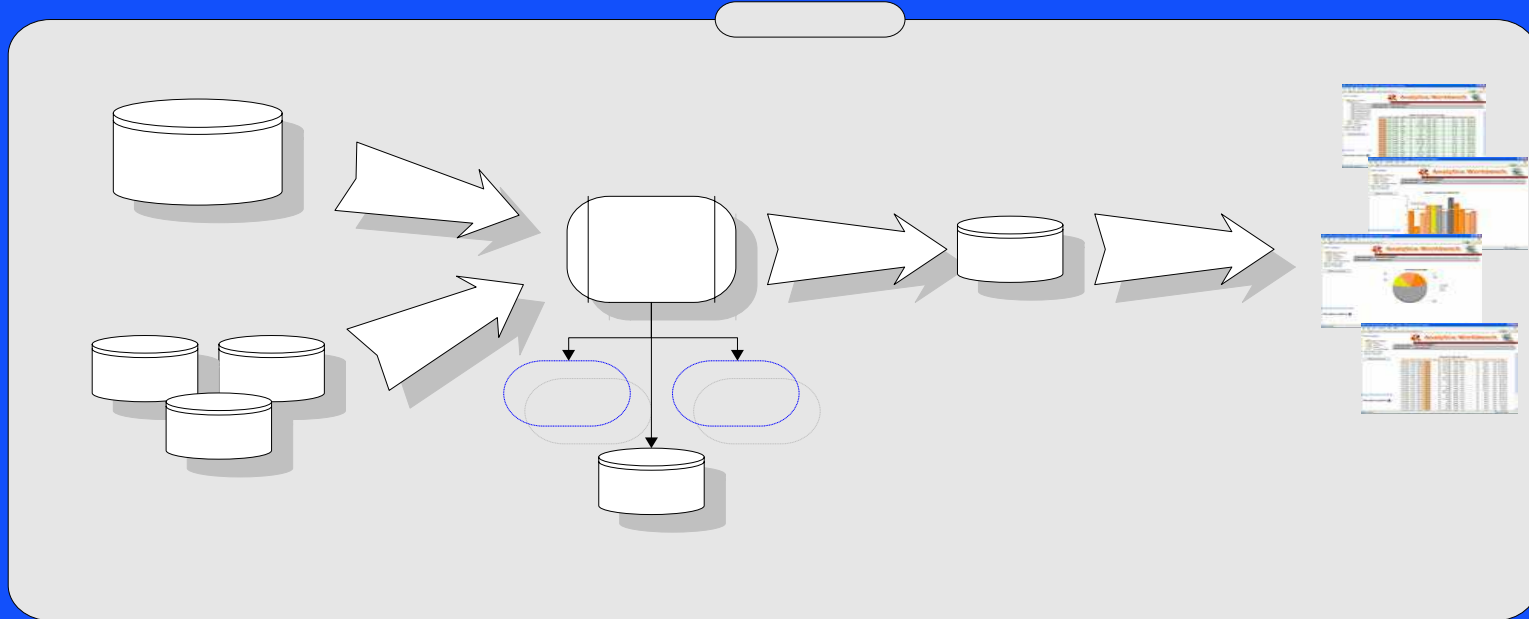
Data Analysis Tools

Tools	Capacity	Ease of use	Analytic Capabilities
Microsoft Excel	 <ul style="list-style-type: none"> • 65,536 rows by 256 columns • 255 chars per field 	 <ul style="list-style-type: none"> • Standard, easy to use office application 	 <ul style="list-style-type: none"> • Data analysis toolkit • Built-in functions
Microsoft Access	 <ul style="list-style-type: none"> • 2 GB database • 255 fields (columns) 	 <ul style="list-style-type: none"> • Training is required 	 <ul style="list-style-type: none"> • Built in functions • Great for joining tables
ACL	 <ul style="list-style-type: none"> • Unlimited 	 <ul style="list-style-type: none"> • Requires basic training • Menu based 	 <ul style="list-style-type: none"> • Complete set of preprogrammed analysis
Monarch	 <ul style="list-style-type: none"> • 1,000,000 input pages 	 <ul style="list-style-type: none"> • Training is required 	 <ul style="list-style-type: none"> • Provides basic analytic capabilities
Microsoft SQL Server	 <ul style="list-style-type: none"> • 1,048,516 terabytes • 1,024 columns 	 <ul style="list-style-type: none"> • Advanced training required 	 <ul style="list-style-type: none"> • Built in functions • Great for joining tables

 Excellent
  Good
  Satisfactory
  Poor
  Very poor

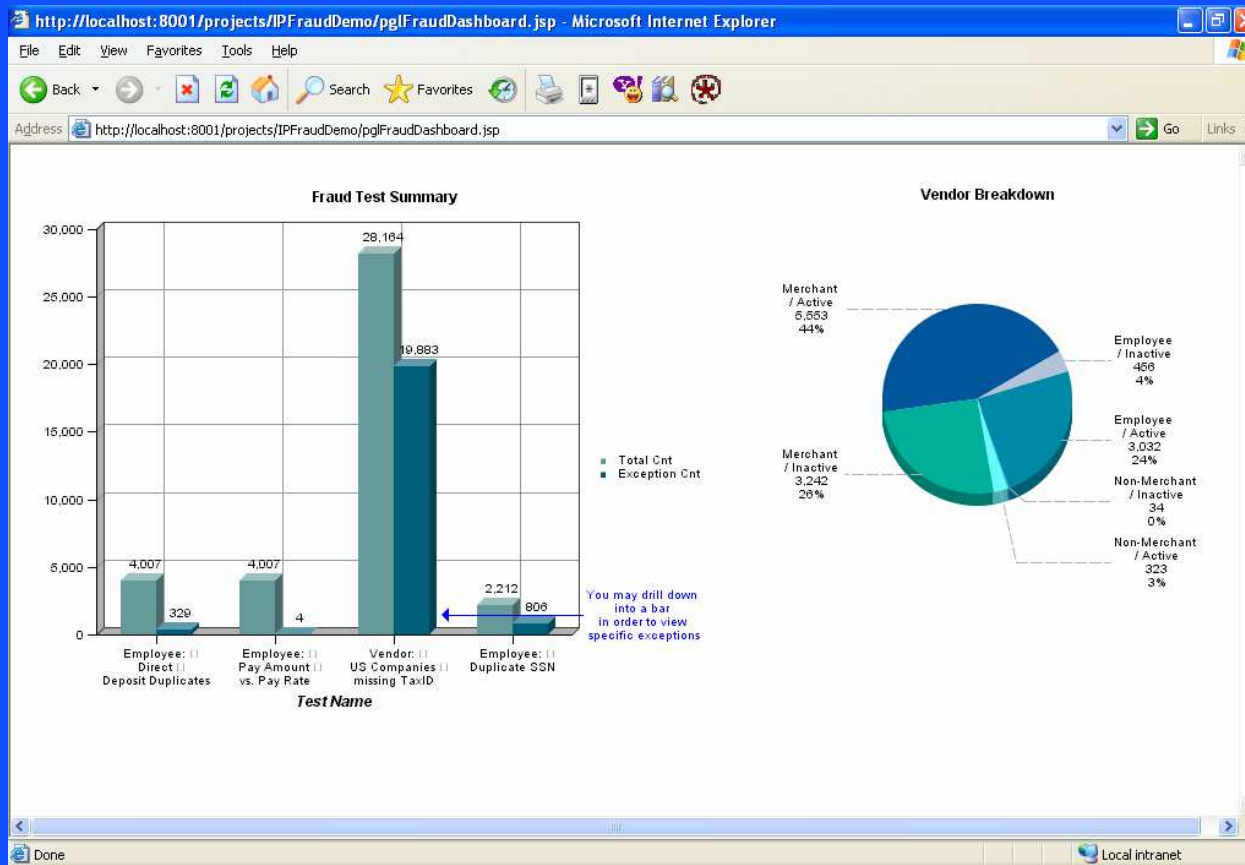
CARTA

Composite Application, Right-Time Architecture (CARTA)



CARTA

Composite Application, Right-Time Architecture (CARTA)



Examples of Fraud

- ◆ **Fraud Analysis** – A simple analysis of data such as payroll, employee, vendor, accounts payable, accounts receivable, and much more, can help determine if fraud is occurring
- ◆ ***Payroll Fraud***
 - Duplicates (i.e. payees on same date, same or similar names, direct deposit account numbers)
 - Paychecks being created for employees that have no time and attendance, no expenses, no vacation, little or scarce personnel records, etc
 - Wages inconsistent with job classification
 - Pay date precedes employment date
 - Terminated employees continuing to be paid

Examples of Fraud

◆ *Purchasing Fraud*

- Duplicate disbursement amounts
- Duplicate invoice numbers/dates
- Duplicate disbursements on same date
- Disbursement to vendor not in vendor database
- Vendor name/address/phone # same as employee name/address/phone #
- Invoice's "pay to" address different from address in vendor or contract database

◆ *Refund Fraud*

- Refund check "pay to" address different from address in customer database
- Refund check amounts just below higher-level-approval-required threshold
- Refund check "pay to" name and/or address matches to employee name and/or address

Examples of Fraud

◆ *Accounts Payable*

- Producing reports of debit balances
- Producing reports of large or old suspense items
- Testing accumulation of payables balances
- Producing reports of balances with no scheduled payment date
- Producing reports of new suppliers
- Search for unrecorded liabilities
 - » These reports help identify
 - ◆ Inefficient invoice processing
 - ◆ Spend reduction opportunities
 - ◆ Inefficient purchasing organization
 - ◆ Mismanagement of cash flow
 - ◆ Inconsistent payment terms across organizations
 - ◆ Data quality issues within master files

Examples of Fraud

- ◆ **Cash Skimming**

- Unrecorded or understated sales or receivables
- Theft of cash receipts
- Lapping

- ◆ **Fraudulent Disbursements**

- Fictitious vendors
- Billing schemes
- Over-billing schemes
- Pay and return scheme
- Check kiting
- Theft of company checks and check tampering
- Expense reporting schemes

Examples of Fraud

- ◆ ***Inventory***

- Theft of inventory
- False sales, write-offs and other adjustments
- Inventory valuation schemes

- ◆ ***Fixed Assets***

- Theft of fixed assets
- Unauthorized changes in depreciable life
- Unsupported additional / deletions / modifications to fixed asset sub ledger

Detection Techniques: Digitizing

Use of special functions to convert names to digits, and comparison of digits for phonetic duplicates.

Soun dex Code	Vnum	Vname	Addr1	City
A153	68	AVNET	P.O. BOX 847722	DALLAS
A153	57	AVNET EMG	P.O. BOX 847722	DALLAS
P626	251	PROGRAMMERS PARADISE	P.O. BOX 17043	NEWARK
P626	855	THE PROGRAMMER'S SHOP		NEWARK

Testing Example: Related Party Transactions

Match: Addresses, Phone Numbers, SSN-FEDID

Vendor LOC	VCODE/	VNAME/	Vendor Address1/	Vendor City/
Employee LOC	Employee SSN	Employee (fname+lname)	Employee Address 1	Employee CITY
DST2017	LES142	LESLIE SMITH WELDING	1420 CHERRY HILL LOOP	SPRINGFIELD
2017	333245232	LESLIE SMITH	1420 CHERRY HILL	SPRINGFIELD
DST0086	14195	MORRIS COMPUTER SERVICES	4402 CODY AVENUE	BELMONT
0086	435443344	GARY MORRIS	4402 CODY AVE	BELMONT

VENDORNUM	NAME1	STREET	c_dummy	Zip	Phone
SSN	NAME	ADD1	ADD2		
0040006668	T ENTERPRISE	RT 2 BOX 8	MENTOR	56736	312-444-4444
232456545	Tischman, Richard C	Rt 2 Box 8	Mentor	56736-9703	630/4548976

Testing Example: Corporate Card Misuse

String Searches

MARY E HAWKINS	3787-228607-31002	BLUE CHIP HOTEL & CASI	0000000000000	10/18/2002	0	195.8
LINDA W TAETZ	3787-215797-07006	DOUBLETREE CLUB HOTEL	0000009270197	9/30/2002	0	82.16
LES HENDERSON	3783-503677-64001	FAMOUS ENTERTAINMENT I	0000027964084	10/6/2002	0	60
JIM MACKLIN	3785-007067-91004	OKLAHOMA ENTRTMNT INC	0000028131482	10/8/2002	0	25
LES HENDERSON	3783-503677-64001	FAMOUS ENTERTAINMENT I	0000028289674	10/10/2002	0	23.5
KAREN L GRZANNA	3782-459637-92002	PINE TREE SUPPER CLUB	0000095831039	10/3/2002	0	15.74
MARY E HAWKINS	3787-228607-31002	BLUE CHIP CASINO INC	0000000018852	10/15/2002	0	13.95

ACCT	ESTB_NAME	REFNUM	PROCESSDT	BILLAMT
3785-016567-54000	GO GO TOURS	0000514873321	9/26/2002	2568.24
3794-143377-31000	TARGET 1764	0000001764085	9/27/2002	328.77
3785-424387-72001	WAL-MART STORES INC	0000055279216	10/1/2002	310.94
3794-187357-11001	TARGET STORES 1122	0000001122112	9/26/2002	284.11
3787-228607-31002	THE JAMESON INN 89	0000144010005	10/12/2002	283.24
3785-014867-22003	BORDERS BOOK SHOP 23	0000002345556	9/26/2002	281.07
3785-297717-11001	BOSTON DUCK TOURS, LTD	0000002199239	10/8/2002	261.5
3794-612827-11008	WAL-MART STORES INC	0000052877595	9/30/2002	257.3
3785-016567-54000	WAL-MART STORES INC	0000085897272	10/14/2002	250.73
3783-139627-03006	WAL-MART STORES INC	0000099068409	10/19/2002	241.06
3785-007067-91004	WAL-MART STORES INC	0000074434321	10/9/2002	232.44
3785-260367-82009	TARGET STORES 1186	0000001186074	10/14/2002	216.47
3794-009057-11003	THE JAMESON INN 80	0000441010004	9/28/2002	205.62
3785-016567-54000	SEARS ROEBUCK 2206	0000005215149	9/29/2002	204.34
3794-143377-31000	TARGET STORES 13	0000000013073	9/26/2002	195.84
3785-484307-21003	COSTCO 99142	0000191330040	9/28/2002	192.6
3794-664537-21009	SEARS ROEBUCK 1029	0000001036170	10/22/2002	183.76
3794-036757-01006	WAL-MART STORES INC	0000056441284	10/2/2002	183.2

Testing Examples: Ghost Employees Testing

Non valid SSN:

AH_BUSINES	WORK_LOCAT	NAME	SSN	STATUS
Retail Operations	09226 Miami	Jones, David	333-24-5555	A
Retail Operations	09453 Clearwater	Tap, John	542-44-9999	A
Retail Operations	30507 Irvington	Brown, Paul	323-33-2345	A
Retail Operations	32544 Massapequa	Hamilton, Gavin	324-54-3456	A

Other Tests:

- Test for no Withholdings
- No Vacation or Sick Days
- Invalid address

Testing Examples: Duplicate Vendors and Payments

- ◆ Entertainment Company
 - 17% duplicate vendors
 - \$500,000 in recovered duplicate spend
 - \$750,000 in duplicate spend
- ◆ Computer Manufacturer
 - 5% duplicate vendors
 - \$16M in potential duplicate spend
- ◆ Information Services Company
 - 9% duplicate vendors
 - \$1.6M in possible duplicate spend

Testing Examples: Duplicate Payments

VENDOR_NAME_ NORMALIZED	VENDOR_NAME	VENDOR_NBR	INVOICE_NBR	CHECK_NBR	INVOICE_DATE	DISTRIB_AMOUNT
PHARMERICA	+PHARMERICA	000000036	411316711119	23345059	11/19/2001	5,323.16
PHARMERICA	PHARMERICA	000664457	411316711119	23375862	11/19/2001	5,323.16
WESTERNFOODSINC	+WESTERN FOODS INC	000000052	378158	23247120	9/6/2001	3,828.95
WESTERNFOODSINC	WESTERN FOODS INC	000912302	378158	23266700	9/6/2001	3,828.95
WESTERNFOODSINC	+WESTERN FOODS INC	000000052	363172	23119489	6/26/2001	3,394.65
WESTERNFOODSINC	WESTERN FOODS INC	000912302	363172	23129197	6/26/2001	3,394.65

VENDOR_NAME_ NORMALIZED	VENDOR_NAME	VENDOR_NBR	INVOICE_NBR	CHECK_NBR	INVOICE_DATE	DISTRIB_AMOUNT
HALO	HA LO	000721207	827566	23336819	9/6/2001	947.55
HALO	HALO	000591572	827566	23298033	9/6/2001	947.55
GOLDBERGANDSOLOVY	+GOLDBERG AND SOLOVY	000000054	826033	23412062	2/12/2002	942.32
GOLDBERGANDSOLOVY	GOLDBERG AND SOLOVY	000278066	826033	00000000	2/12/2002	942.32

Payroll Fraud

- ◆ Databases involved
 - Payroll
 - Personnel
 - Time & attendance
 - Employee directory
 - Terminated employee directory
 - Valid SSN listings
 - Leave and vacation
 - Employee expenses

Possible Tests for Payroll Fraud

- ◆ Duplicates:
 - Payees on same date
 - Same or similar names
 - SSNs
 - Addresses
 - Telephone numbers
 - Direct deposit account numbers
 - Work locations
 - Work telephone numbers

Possible Tests for Payroll Fraud

- ◆ Comparisons: Paycheck, but ...
 - no time & attendance
 - not in employee directory
 - no leave ever taken
 - no expenses
 - terminated employee
 - no pension or other deductions
 - no valid SSN
 - no, or scarce, personnel data

Possible Tests for Payroll Fraud

- ◆ Employees with P.O. Box addresses
- ◆ Wages inconsistent with job classification
- ◆ Payroll disbursements above certain amounts (by pay period or cumulative)
- ◆ Premium pay above certain amounts
- ◆ Benefit contributions but not on payroll
- ◆ Pay date precedes employment date
- ◆ Overtime with other activity indicators

Purchasing Fraud

◆ Databases involved

- Vendor
- Personnel
- Dun & Bradstreet
- Employee directory
- Terminated employee directory
- Employee expenses
- Inventory
- Accounts payable; accounts receivable

Possible Tests for Purchasing Fraud

- ◆ Duplicate disbursement amounts
- ◆ Duplicate invoice numbers/dates
- ◆ Duplicate disbursements on same date
- ◆ Disbursement to vendor not in vendor database
- ◆ Vendor name/address/phone # same as employee name/address/phone #
- ◆ Vendor name similar to employee name

Possible Tests for Purchasing Fraud

- ◆ Purchases inconsistent with inventory
- ◆ Missing purchase request (PR) #, purchase order (PO) #, receiving report (RR) #
- ◆ Names on PR, PO, or RR missing; or the same; or not in employee database
- ◆ Vendor address is P.O. Box
- ◆ Invoice's "pay to" address different from address in vendor or contract database

Possible Tests for Purchasing Fraud

- ◆ Vendor with no telephone number or contact name
- ◆ Invoice numbers from same vendor in unbroken sequence
- ◆ Invoice amounts just below higher-level-approval-required threshold
- ◆ Multiple vendors with same address, telephone, contact person
- ◆ Vendors with similar or similar-sounding names

Possible Tests for Purchasing Fraud

- ◆ Unit prices rising rapidly or inconsistent with historical prices
- ◆ Unit prices for same items inconsistent among different vendors
- ◆ Matches of item numbers/description being purchased and sold for scrap
- ◆ Inventory level fluctuations inconsistent with production or sales
- ◆ Contract or PO “ship to” address matches employee address
- ◆ Contract or PO “ship to” address does not match any company site addresses
- ◆ ?
- ◆ ?

Data Analysis – A Generic Approach

- ◆ Identify all available databases
 - Internal to the organization
 - External to the organization
- ◆ List record fields in all available databases
- ◆ Formulate hypotheses about record field relationships
- ◆ Program analytical tests for each hypothesis
- ◆ Run tests (output is your “hit list”)
- ◆ Evaluate initial hit list and refine the tests
- ◆ Re-run refined test to produce shorter, more meaningful hit list (repeat steps 5-7, as needed)

Data Analysis – A Generic Approach

- ◆ Evaluate (via record analysis, interview, or other technique) every item on the refined hit list
- ◆ Dispose of every hit:
 - Valid explanation found
 - Probable improper transaction – full investigation needed
- ◆ Identify control problems and corrective actions needed

Data Analysis

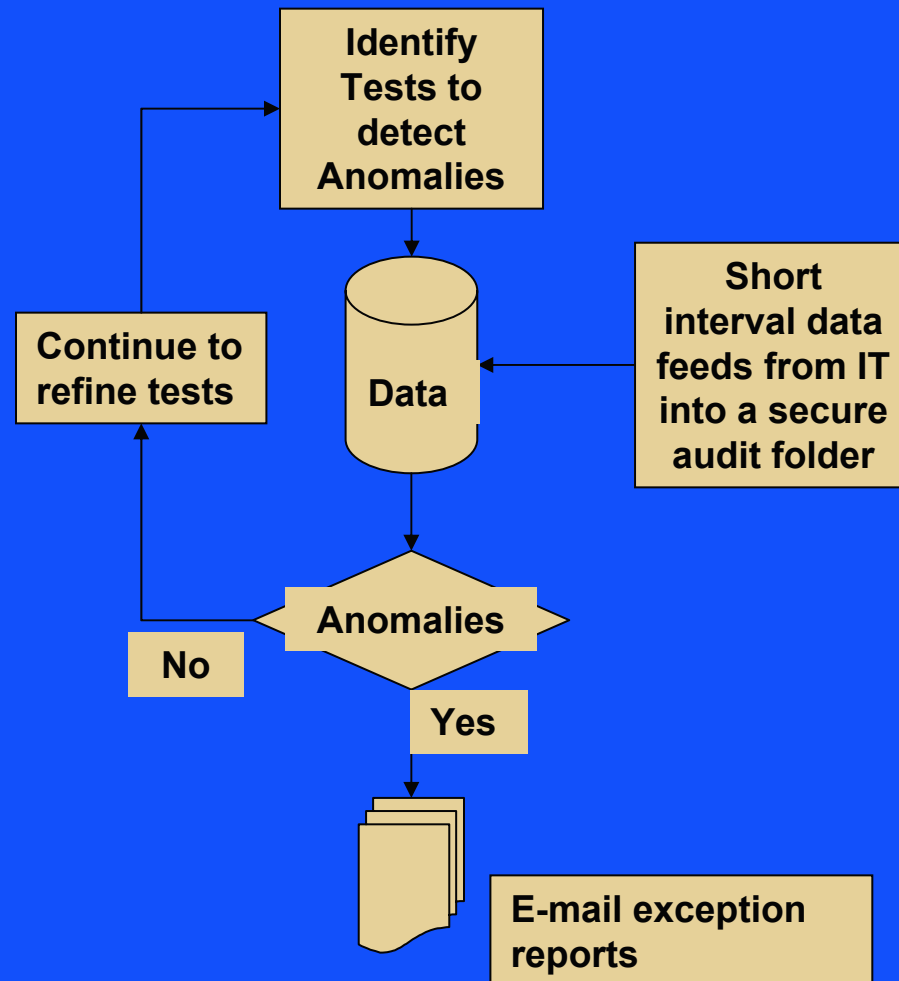
- ◆ Keep the programs developed and refined over time
- ◆ Run as batch / script programs as frequently as resources allow
- ◆ Explore feasibility of *real-time* tests of transactions

Real-Time Transaction Tests

- ◆ Add a loop to the existing accounting system transaction process
- ◆ Loop goes through the internal or external audit organization
- ◆ Transactions that fail the audit organization's [secret] tests get stopped for further analysis

CAATs in Continuous Monitoring

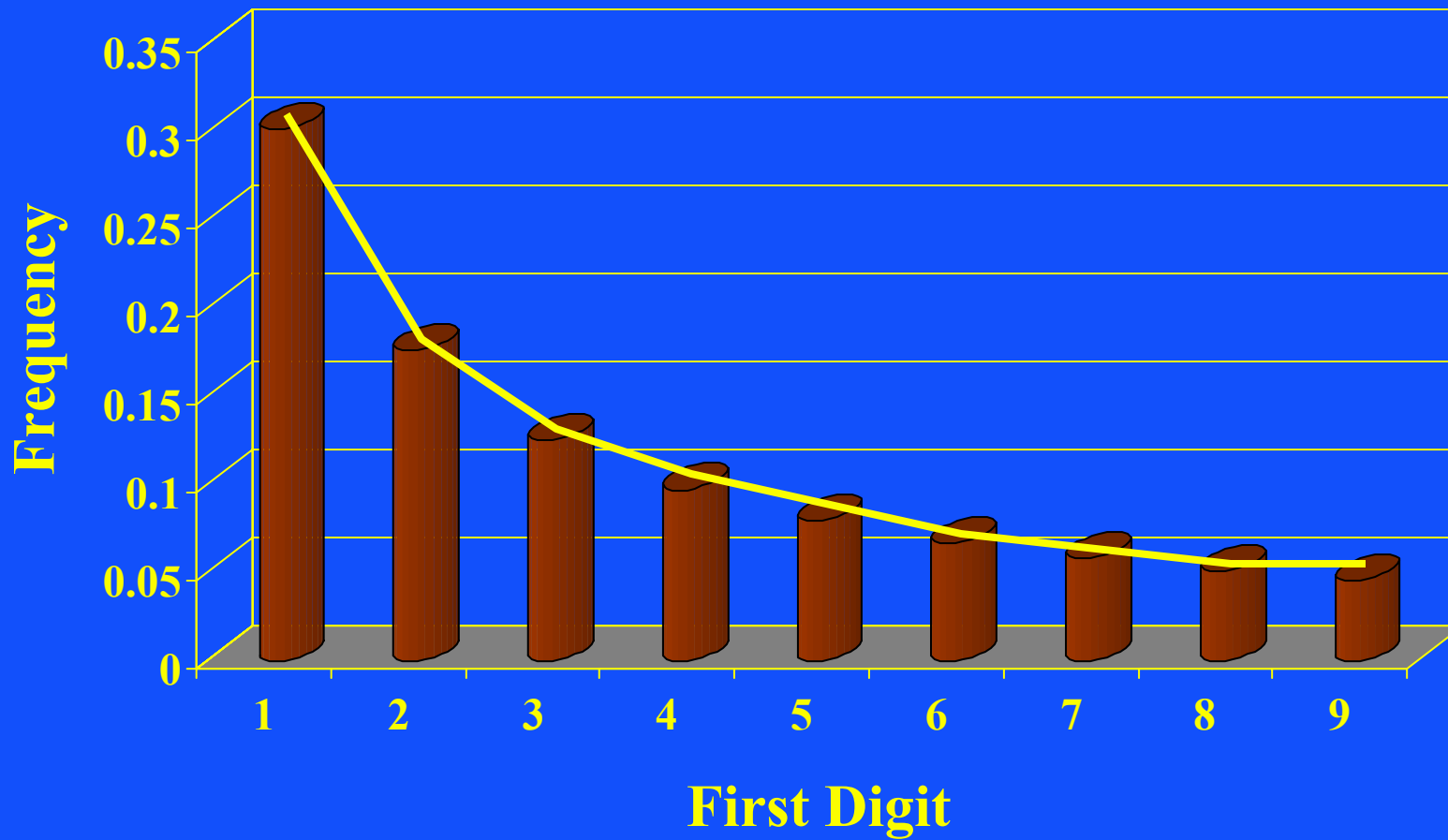
- ◆ Identify data patterns indicative of fraud.
- ◆ Develop Fraud Criteria
- ◆ Scan data at short intervals.
- ◆ Trigger alarms when data meets criteria.
- ◆ Data tests can be continuously refined.



Benford's Law

- ◆ A Digital Analysis Technique
- ◆ The first digits of numbers are not randomly distributed
- ◆ Distribution of first four digits:
 - 1 – 30.1%
 - 2 – 17.6%
 - 3 – 12.5%
 - 4 – 9.7%

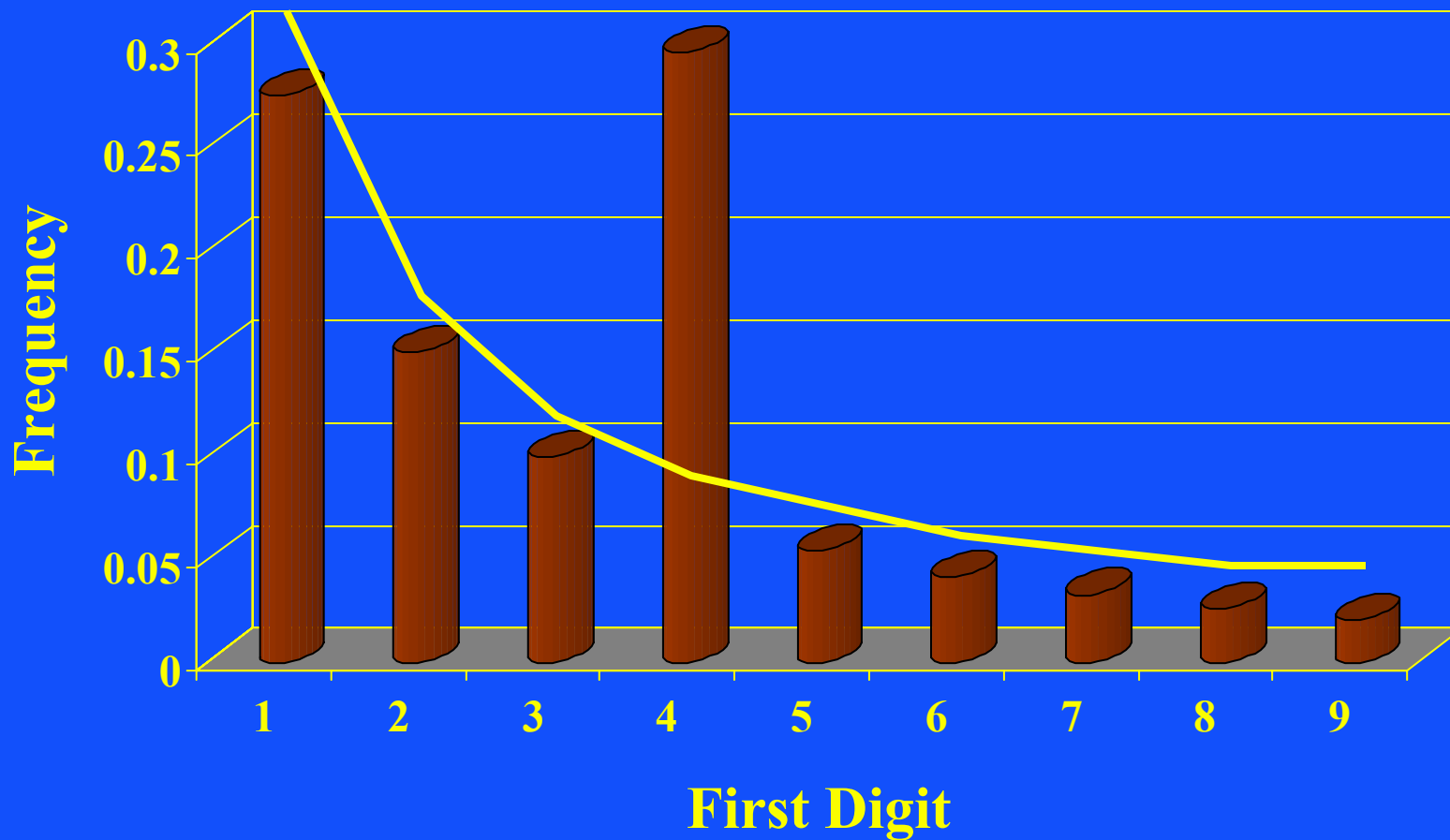
Benford's Law



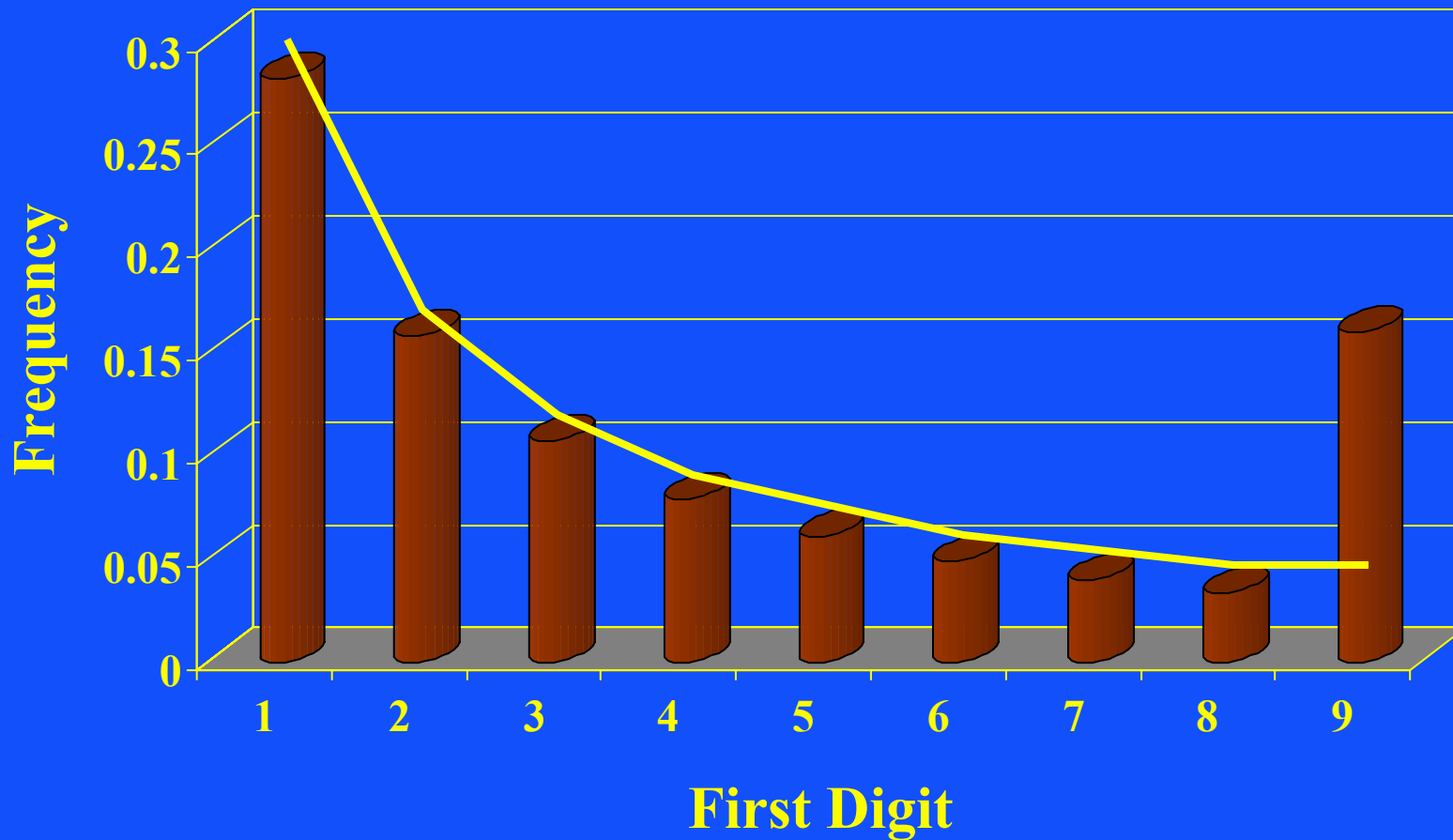
Benford's Law

- ◆ So what?
- ◆ Use Benford's Law to identify anomalous transactions in:
 - Accounts payable and expenses
 - Accounts receivable and sales
 - Refunds
 - Payroll
 - Estimations in the general ledger

Purchase Order Amounts



Bank Deposit Amounts



Benford's Law

- ◆ Invented, contrived, or manipulated numbers do not follow Benford's Law
- ◆ Doesn't apply to all data sets
 - e.g. sets of data with numbers that have imposed ceilings or floors such as IRA contributions or hourly wage rates
- ◆ Once again, however, human analysis of anomalies is needed

Financial Crime Investigator

- ◆ Artificial intelligence or expert system
- ◆ Relational database containing:
 - Fraud indicators
 - Fraud schemes
 - Fraud statutes and elements of proof
 - Investigative steps
 - Steps for database queries to detect specific schemes

Financial Crime Investigator

- ◆ If you have a fraud indicator, FCI will list possible fraud schemes for that indicator
- ◆ If you suspect a fraud scheme, FCI will:
 - List other indicators to look for
 - List fraud statutes under which the scheme can be prosecuted
- ◆ If you identify a potential fraud statute violation, FCI will list the elements of proof needed to prove the crime

Financial Crime Investigator also has:

- ◆ Decision trees for opening, conducting, continuing, and terminating an investigation
- ◆ Checklists for making decisions at any point in your case development
- ◆ Library aids: interviewing techniques, using the case theory approach, case tactics and strategy
- ◆ Guidance for writing investigation reports
- ◆ Glossary of terms (hypertext)
- ◆ “How-to” guides (e.g. proof of cash; file a complaint/get a case prosecuted; prove intent; find mail-drop addresses; etc.)
- ◆ Key sources for additional data such as public records; credit information; bankruptcy/judgment/lien information; vehicle registrations; business background information; etc.

Case Study: Barings Bank

- ◆ Nick Leeson was a 27-year-old rogue derivatives trader in Barings' Singapore office
- ◆ He single-handedly collapsed the 233-year-old bank by trading with bank funds
- ◆ He reported his gains (and got large bonuses as a result); but hid his losses in a "5-eights" account (account number 88888)
- ◆ The bank collapsed in Feb. 1996
- ◆ In Dec. 1995, account 88888 had \$512 million in losses hidden in it
- ◆ Among the means Nick used to conceal the losses in 88888 was "suppression" of the account in printed reports to London
- ◆ Could data analysis have saved Barings?

Case Study: Barings Bank

- ◆ Simply totaling – electronically – the debits and credits in the reports to London would have revealed the “suppression”
- ◆ Account 88888 was supposed to be a low-balance adjustment account for minor trading errors; hence, a simple stratification test would have revealed the anomaly

Case Study: The Fool Service Motor Pool

- ◆ Whatsamatta University operates a motor pool to service and maintain its large fleet of vehicles (cars, trucks, and research vessels)
- ◆ Arthur Fulldodger has managed the motor pool for 25 years, and everyone agrees he does a terrific job
- ◆ Anne Alasiss, CPA, is assigned to test motor pool controls and expenses as part of the annual audit
- ◆ Anne notes that the manager, Art, seems to be involved in every aspect of running the motor pool and keeping its service records
- ◆ Anne downloads the service pool's database of service records and conducts a number of tests using IDEA
- ◆ Anne uses vehicle mileage records and gasoline charge card records to calculate vehicle miles per gallon

Case Study: The Fool Service Motor Pool

- ◆ Anne finds that most vehicles appear to be getting very poor gas mileage--less than 10 miles per gallon
- ◆ A more detailed, monthly vehicle-by-vehicle analysis reveals that some vehicles get very good mileage (30+MPG) in some periods and very poor mileage (<5 MPG) in others
- ◆ Further investigation (including surveillance) reveals that faculty and students fill their vehicles at the motor pool
- ◆ Art charges them \$.50/gal; pockets the money; and records the gas charge against university vehicles
- ◆ Anne also extracts and plots repair costs by vehicle on a month-by-month basis
- ◆ This analysis shows several anomalous results

Case Study: The Fool Service Motor Pool

- ◆ New vehicles seem to have an unusual number of repairs--even vehicles still under warranty
- ◆ Graphs show a peak of repair activity in the two months prior to the end of each vehicle's service history
- ◆ What did Anne's further investigation reveal?
- ◆ Art is repairing cars for faculty and students at "deep discount" rates
- ◆ Art is refurbishing fully-depreciated, "no-more-useful-life-left" vehicles just before he "retires" them by selling them to his pal, Rudolph Mentari, who happens to own "Honest Rudy's" Used Car Dealership



• Source: http://www-personal.si.umich.edu/~nsharma/dikw_origin.htm

And now ...





Using Computer-Assisted Auditing Techniques to Detect



Appendix

Data Analysis Techniques: Detailed Commands

Filters

- ◆ Show me only certain transactions that I might be interested in
- ◆ I.e. filter out the “static” inherent in large databases
- ◆ E.g. from the database of all invoices paid this month, show me those with invoice dates more than 30 (or 60, or 90) days prior to this month

Sorting

- ◆ Put the data into an order that is easier to analyze
- ◆ E.g. aged accounts payable
- ◆ Sort by vendor name;
- ◆ Or sort by vendor address;
- ◆ Or sort by vendor telephone number;
- ◆ Or EFT account number

Statistics

- ◆ Average value, standard deviation, highest/lowest value, etc.
- ◆ Show me all vendor payments that are more than two standard deviations from the mean
- ◆ Show me every unit price for product A that is more than 1 standard deviation from the mean

Gaps

- ◆ Used when we have pre-numbered forms or transactions
- ◆ Show me all missing checks
- ◆ Show me missing health insurance claims
- ◆ Show me missing purchase orders
- ◆ Show me missing vouchers for benefits

Duplicates

- ◆ Used in situations when duplicates should not occur
- ◆ Show me all payroll transactions in the pay period that have duplicate:
 - Payees
 - SSN
 - Payment addresses
 - EFT transfer destinations

Aging

- ◆ We all use an aged A/P listing
- ◆ AGE function can calculate the number of days between two date fields
- ◆ Show me the time elapsed from when an item was purchased and placed in inventory and when it was disposed of as “scrap” or “due to obsolescence”
- ◆ Show me the time elapsed between award of a major contract and the contracting officer’s purchase of a condo in the Bahamas

Expressions and Calculations

- ◆ Can be used to test for and detect errors in accounting software
- ◆ But, can also be used to detect outside intervention into an otherwise okay system
- ◆ Recalculate units x unit price and show me all cases where the result does not equal the value in the extended amount field
- ◆ Recalculate vacation accruals for every payroll transaction and show me every case where the result differs from what was recorded

Classify

- ◆ Counts the number of unique values in a selected character field(s) and the corresponding totals of other numeric fields
- ◆ Show me how many hysterectomy procedures have been performed, by sex:
 - Female: 127
 - Male: 3
 - [sex field blank]: 12

Summarize

- ◆ Similar to CLASSIFY, but sorts data by specified field and provides a detailed listing of transaction information for all records in that classification
- ◆ Show me all transactions for vendor A, B, C
- ◆ Show me all payroll transactions for employee A, B, C
- ◆ Show me all employee expenses transactions for employee A, B, C

Stratify

- ◆ Groups transactions into specified ranges of values (strata)
- ◆ Show me numbers of contracts within certain strata
 - \$0 - \$45,000: 27
 - \$45,001 - \$49,000: 12
 - \$49,001 - \$50,000: 425
 - \$50,001 - \$100,000: 5
 - \$100,001 - \$1,000,000: 3

Join and Define Relation

- ◆ JOIN combines data from two databases into a single database
- ◆ DEFINE lets you specify the relationship of interest
- ◆ Show me employee expense claims by employees who were on vacation/sick/holiday leave on the day the expense was incurred
- ◆ Show me all instances in which a person made a DNC/RNC campaign contribution within 60 days of getting a Federally-guaranteed loan

Trend/Regression Analysis

- ◆ Trend analysis looks at historical trends that data exhibit
- ◆ Regression analysis uses historical data to predict what future values will be
- ◆ Looking at electricity usage trends will show anomalous changes
- ◆ Regression analysis of electricity usage will predict what the usage should be in the current period

Appendix

Where to Get More Information

Where to Get More Information

- ◆ *101 ACL Applications: A Toolkit for Today's Auditors*, Richard B. Lanza, CPA, Global Audit Publications, 1999 [604/669-4225; or www.acl.com]
- ◆ *About Benford's Law: I've Got Your Number*, Mark J. Nigrini, [Journal of Accountancy](#), May 1999
- ◆ About ACL: www.acl.com
- ◆ About IDEA: www.audimation.com
- ◆ About Detective Toolkit, Fraud Investigator, and Similarity Search Engine: www.infoglide.com

Where to Get More Information

- ◆ About ViCLAS: www.mtps.on.ca/Year/ViCLAS
- ◆ About Data Mining:
 - www.gartner6.gartnerweb.com
 - www.statserv.com/datamining.html
 - www.datamining.org/sites.htm
 - www.wizsoft.com
- ◆ About *Financial Crime Investigator*:
www.cci2.com/fci_prod.htm

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Vinesh is a Director in PricewaterhouseCoopers' Process Improvement practice specializing in Data Management (DMG). He has over nine (9) years experience in performing IT reviews (security, data mining, project management), and process and controls review. His experience including auditing Entertainment and Media, and Consumer Products, and Technology companies. During the past two years, Vinesh has focused on Data Management in support of internal and external clients with SAS 99 and other automated testing.