



# Forensic Audit and Automated Oversight

**Federal Audit Executive Council**  
**September 24, 2009**

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# Overview

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- Forensic Audit and Automated Oversight
- Data Mining
- Techniques
- Equipment and Software
- Forensic Approach

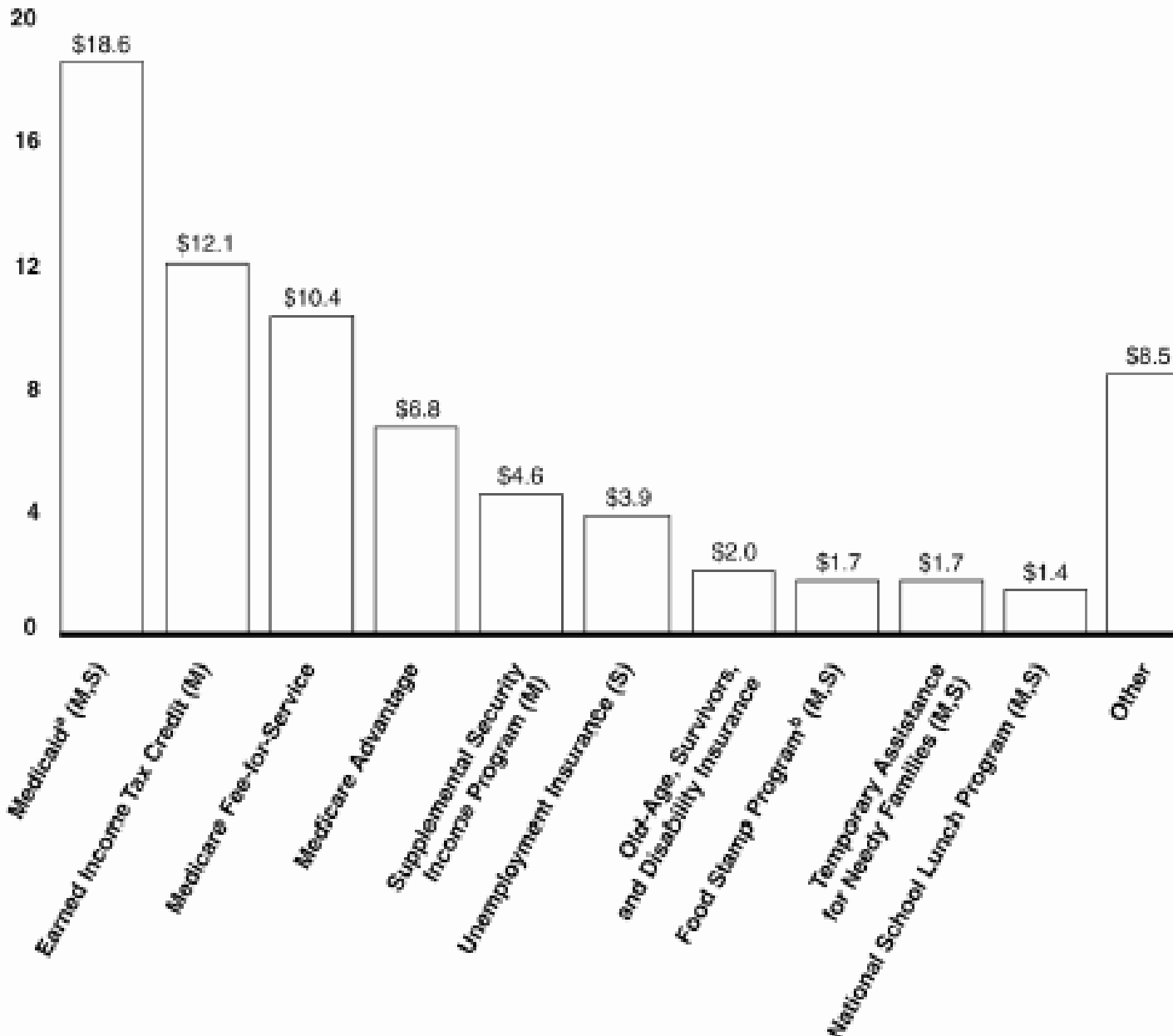
# Forensic Audit and Automated Oversight

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- Definition of Forensic Audit
  - Audit that specifically looks for financial misconduct, abusive or wasteful activity.
  - Close coordination with investigators
  - More than Computer Assisted Audit Techniques (CAATs)
- Forensic audit is growing in the Federal government
  - GAO's Forensic Audit and Special Investigations (FSI)
  - DoDIG Data Mining
- Federal outlays are \$2 trillion annually
  - Approximately 11,000 OIG staff to provide oversight
  - OMB estimates improper payments for Federal government at \$72B (4%)
- GAGAS requires tests for fraud in audit work
- 100% review using automated business rules versus statistical sampling
  - There is a place for both
- Automated Oversight
  - Continuous monitoring
  - Quick response

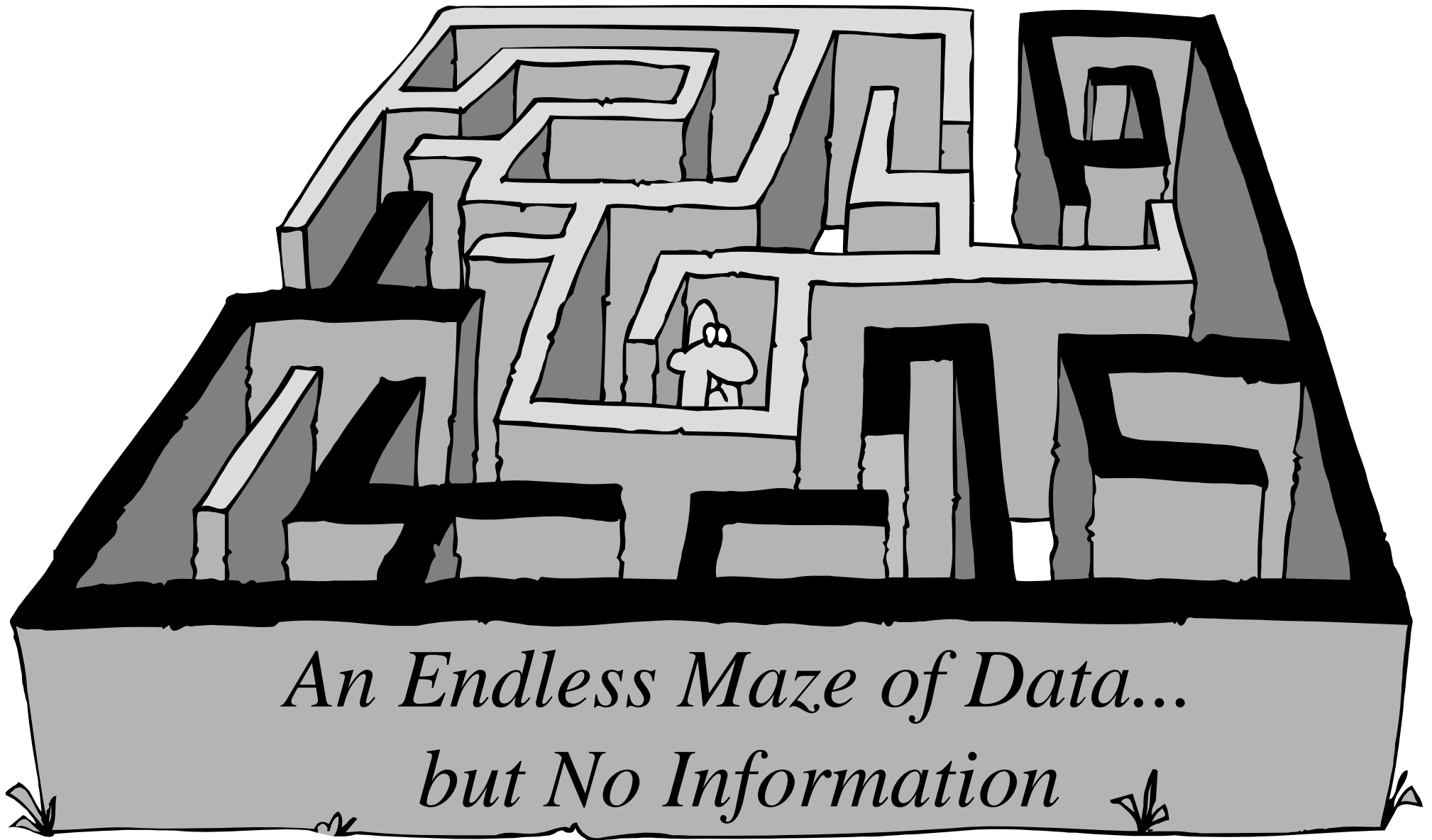
# FY2008 Improper Payment Estimates

Improper payment estimate



# Data Versus Information

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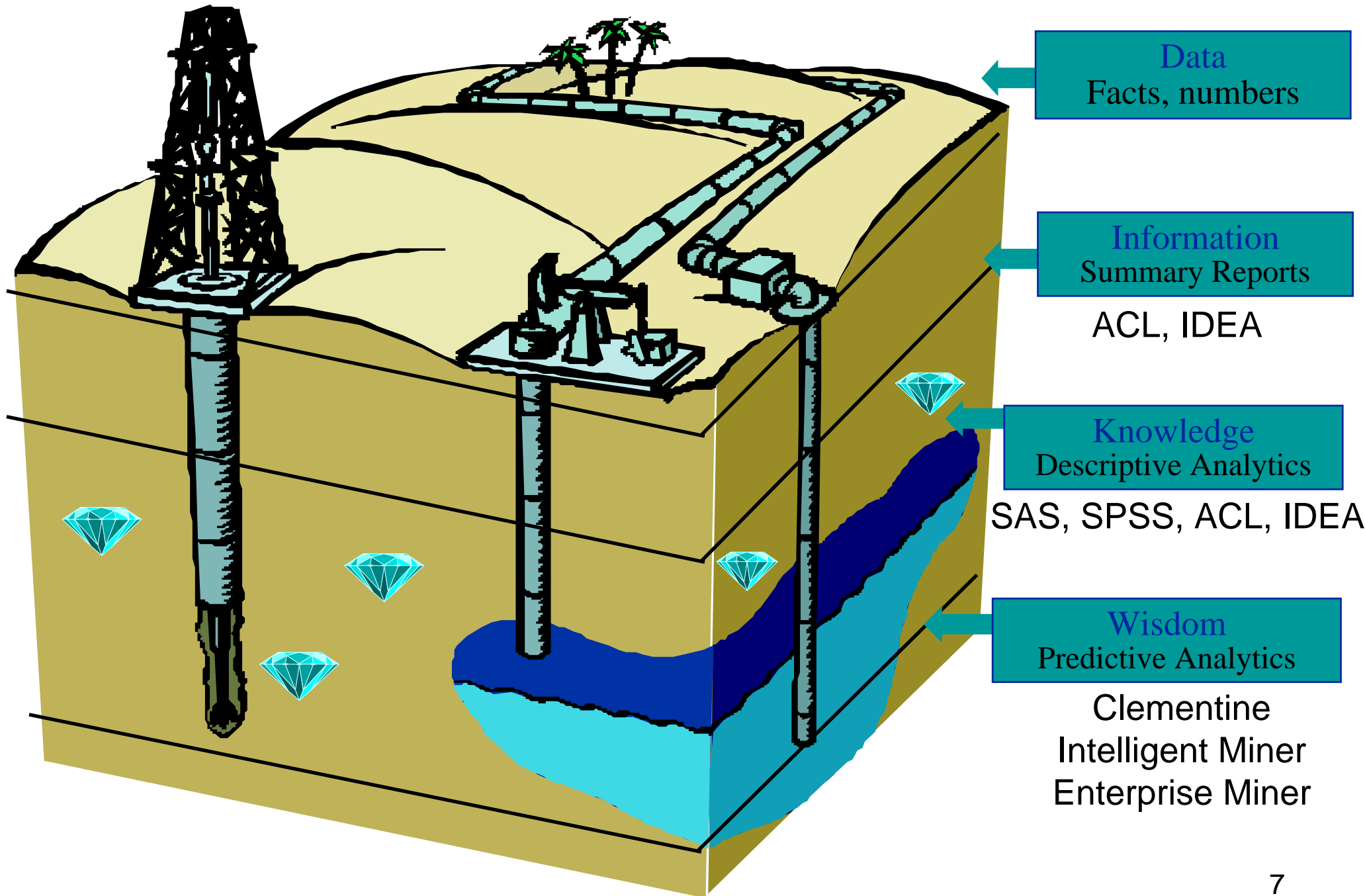
# What is Data Mining?

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- Refers to the use of machine learning and statistical analysis for the purpose of finding patterns in data sets.
  - If You Know Exactly What You Are Looking for, Use Structured Query Language (SQL).
  - If You Know Only Vaguely What You Are Looking for, Turn to Data Mining.
- Most often used (up until recently) in marketing and customer analysis

# Different Levels of Knowledge



# Data Analysis Software - Fosters Creativity

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- Can perform the tests wanted, instead of being limited to what technical staff can, or will, provide
- Not limited to just predetermined data formats and/or relationships
- Can create relationships, check calculations and perform comparisons
- Can examine all records, not just a sample
- 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

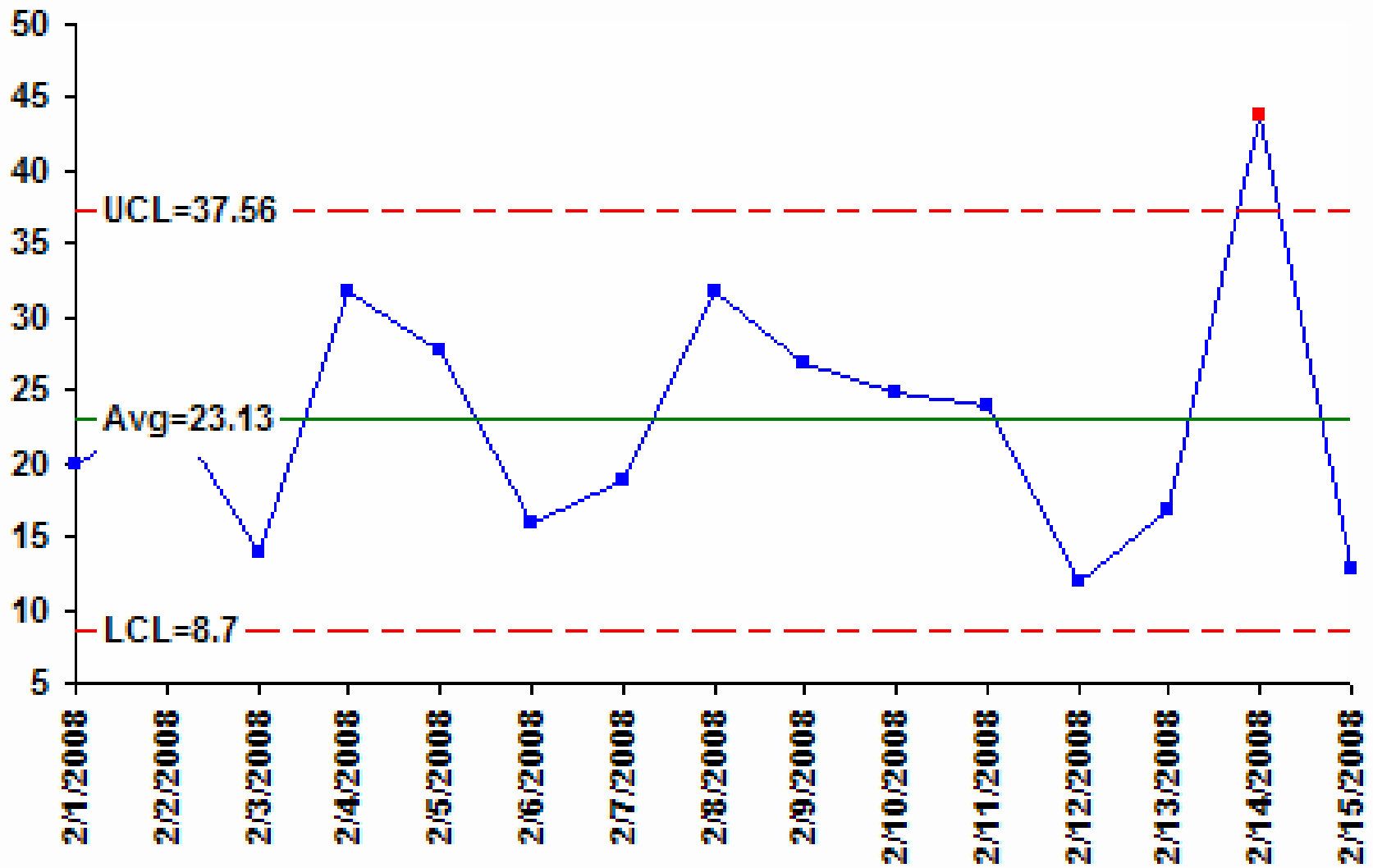


# Common Data Analysis Tests and Techniques

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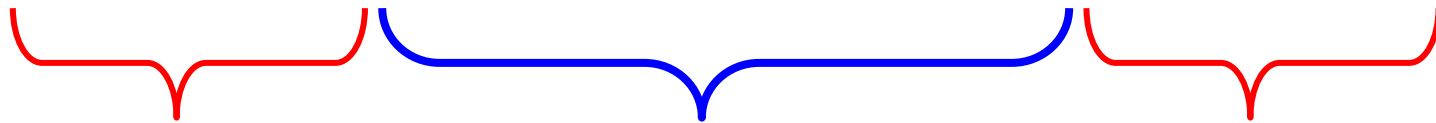
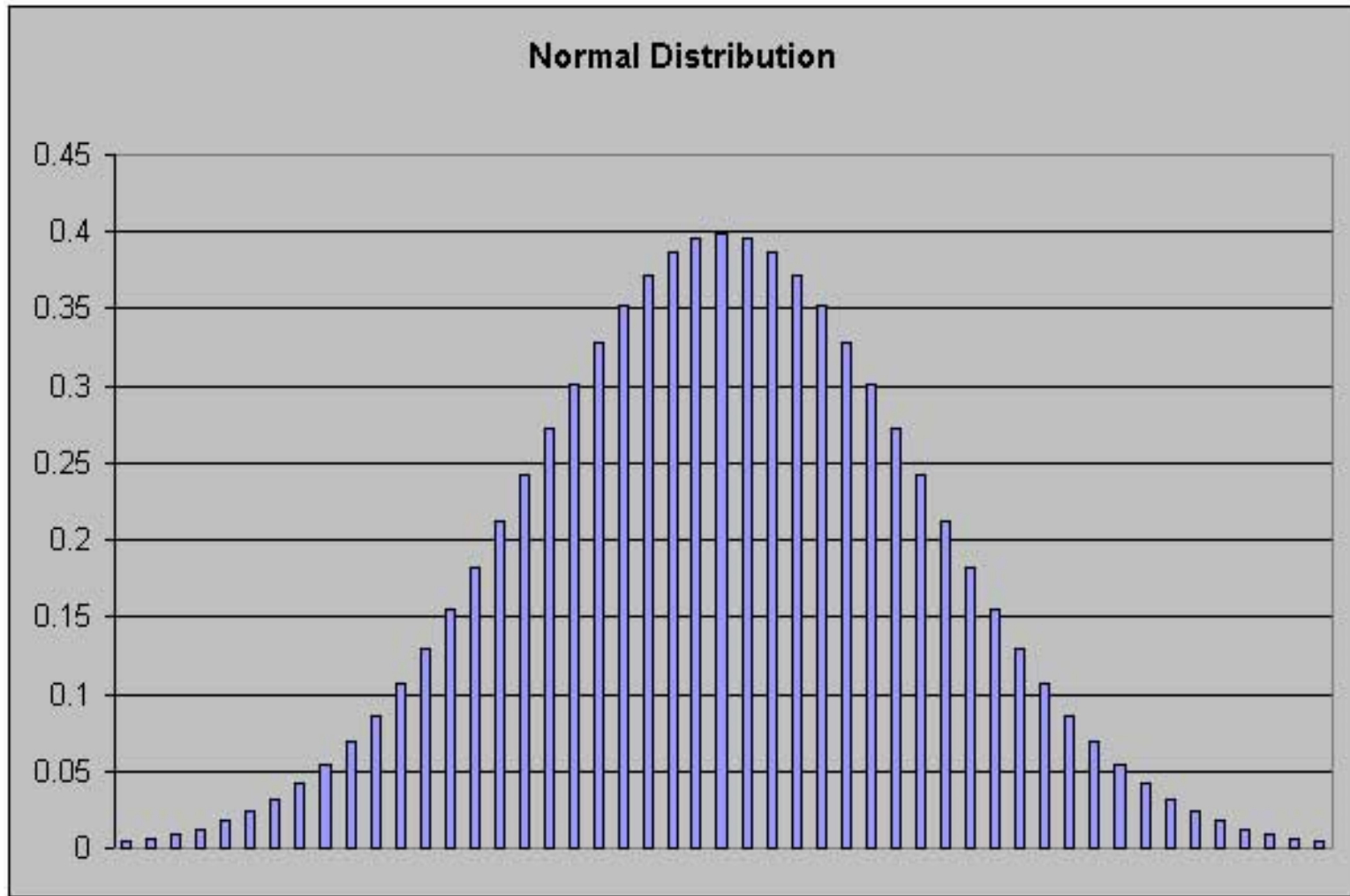
- **Join**
- **Summarization**
- Corrupt data (conversion)
- Blank fields (noteworthy if field is mandatory)
- Invalid dates
- Bounds testing
- Completeness
- Uniqueness
- Invalid codes
- Unreliable computed fields
- Illogical field relationships
- Trend analysis
- Duplicates

# Control Charts



# Frequency Distribution

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Anomalous  
Activity

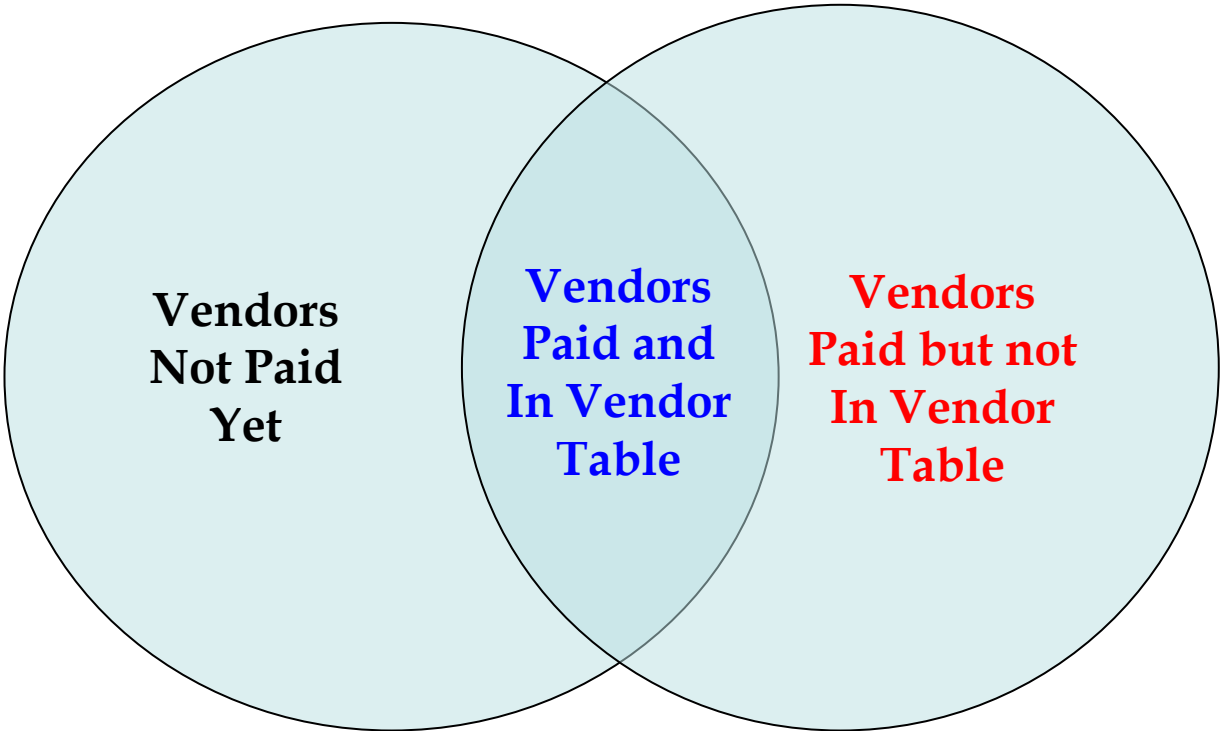
Normal Activity

Anomalous  
Activity

# Comparing Data Files

(Three-Bucket Theory)

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**Vendors  
Not Paid  
Yet**

**Vendors  
Paid and  
In Vendor  
Table**

**Vendors  
Paid but not  
In Vendor  
Table**

**Vendor  
Table**

**Disbursing  
Transactions**

# Hardware and Software Applications

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- Hardware
  - SQL servers
  - Mainframe (QMF)
  - Docking stations
  - Terminal server
- Software Applications
  - Data mining and predictive analytics, e.g., Clementine
  - Data interrogation – e.g., ACL, IDEA, MS Access, Excel
  - Statistical analysis – e.g., SPSS and SAS
  - Link analysis – I2
  - Lexis-Nexis
  - Data conversion utilities (Monarch)
  - Internet, open-source research
  - Access to system query tools

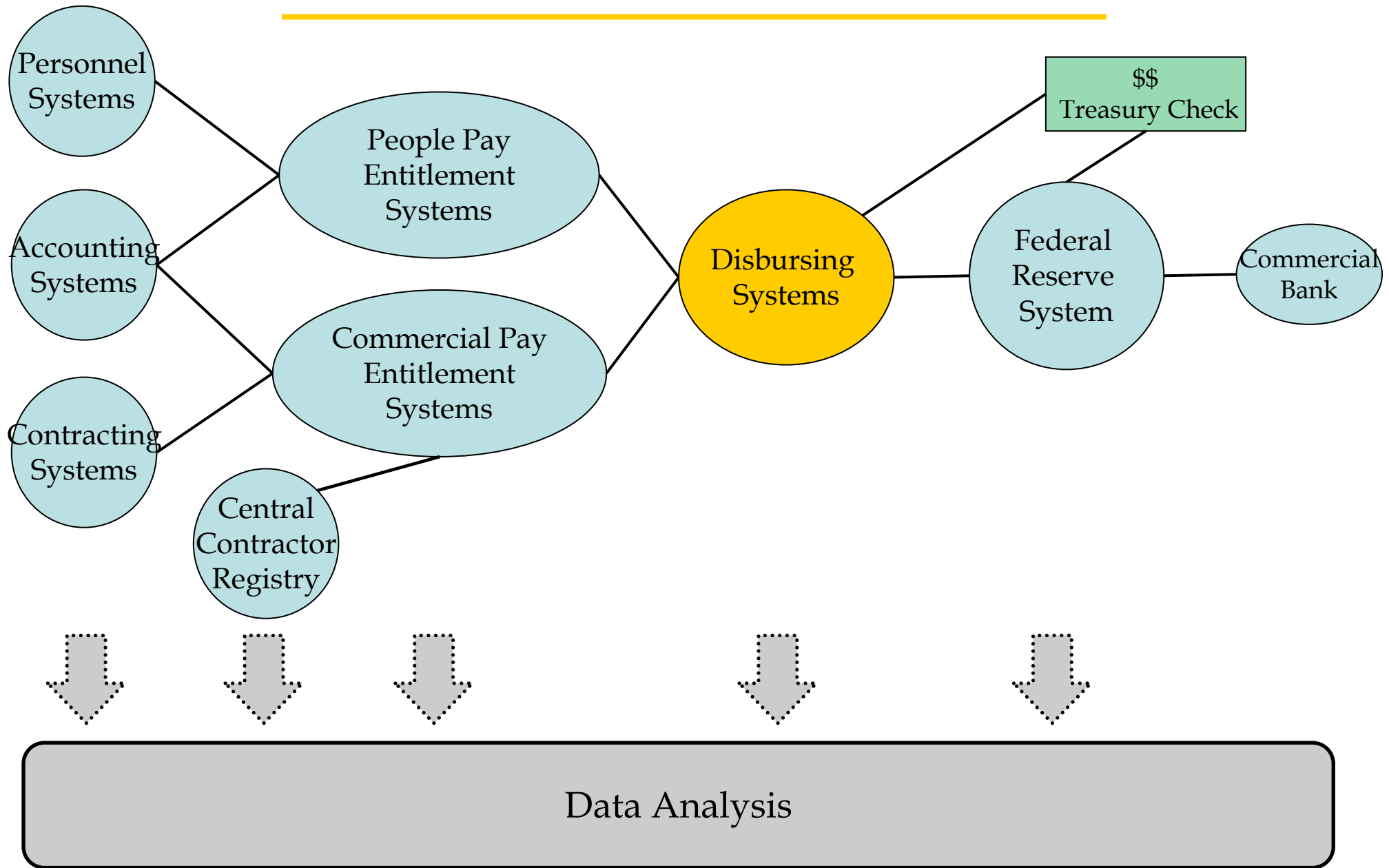
# Forensic Audit Approach

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- Audit objectives and audit universe
- Work with investigations
- Structured brainstorming
  - Consider SME conference
  - Identify indicators of potential fraud and ways to find in data
  - Process to identify financial risks
- Map out the end-to-end process
  - Identify systems and key processes
  - Identify key controls
- Identify and obtain transaction-level data
  - Record layout
  - 1000 record dump
  - ACL, IDEA, and Monarch can read virtually any data format
    - Flat files, Delimited files, Dbase files, MS Access, Report files, ....
    - No file size limits
- Build targeted business rules and run against data
- Examine anomalies

# End-to-End Payment Universe

## Forensic Audit Approach



# Growing a Forensic Audit Capability

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- Developing an organization-wide capability
  - All audit staff should have basic skill with ACL, IDEA, Access
  - Forensic audit units perform more sophisticated analyses
- Phased development
  - Staffing – system savvy, critical thinking, analytical, business process knowledge
  - Hardware and software
  - Training....then immediate application to work
  - Standard audit programs should include data analysis steps
  - Include data analysis measures in staff performance plans
- Reporting Forensic Audit Results
  - Tables
  - Process flows....30,000 feet
  - Forensic techniques used in audit can help improve process...recommend them



# DoD Joint Purchase Card Review (2002)

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- Purpose
  - Develop an automated oversight capability to identify anomalies in purchase card data that may indicate fraud or abuse
  - Joint effort of all Defense audit and investigation organizations
- Transaction Universe
  - 12 million purchase card transactions (\$6.5B)
  - 200,000 cardholders and 40,000 authorizing officials
- Data mining Results
  - Developed 46 fraud indicators from SME conferences
  - 6.5 million transactions (1+ indicator)
  - 13,393 transactions (combinations of indicators)
    - 2066 cardholders and 1604 approving officials in 752 locations
  - 8243 transactions (researched by auditors )
  - 1250 questioned transactions (some level of misuse)
- Outcomes
  - 175 cases with adverse action and 75 investigations opened
  - Capability to embed data mining indicators in credit card company systems to promote continuous monitoring

# Top Performing Combinations

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- 97% Adult Internet sites, Weekend/Holidays
- 67% Purchases from 1 vendor, CH=AO
- 57% Adult Internet sites
- 57% Internet transactions, 3rd party billing
- 53% Interesting vendors, many transactions
- 43% Even dollars, near limit, same vendor,  
vendor business w/few CHs

# Examples of Misuse and Abuse

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- Splitting procurements
- Purchasing goods or services which, although for a valid governmental purpose, are prohibited on a purchase card
- Purchasing items for which there is no government need
- Engaging in fraudulent activity
- Invoices were being certified without being reviewed.

ProfileMain : Form

<b>Approving Official</b>	ACCT	Original AO: LISE MMANGERIE	DoDIG Control Number: CM0117-00407					
	4716304555948895	Latest AO: LISE MMANGERIE	PHONE	SOURCE	TRANS LIMIT	CRATE	COMPANY	SERVICE
	LEVEL:	NAME	(301) 688-2136	U	00000000000000	93495	97	
471630009700012037169349500000000000	9800 SAVAGE RD	Totals Below Are for All Cardholders Associated with this AO						
	STE 6626	Avg Trans Per Month AO Reviews:		19.15	AO CH Count:		15	
	FORT GEORGE G MEADE, MD 20755	Avg Tot Trans Amount Per Month:		\$35,239.53				
<b>Card Holder</b>	ACCT	CARMENMNCIN	PHONE:	SOURCE	TRANS LIMIT	CRATE	COMPANY	SERVICE
	4716300000513219	NAME	(301) 688-2134	U	16971200002698	93495	97	
	CHLEVEL:	9800 SAVAGE RD	CHTransactions:		110	Reviewer Name:		Beverly Welty
471630009700012037149349500000000000	STE 6626	Totaling:		\$45,030.54	Reviewer Phone:		(443) 479-0938	
	FT MEADE, MD 207556626							

TDATE	PDATE	TRANS AMT	MERCHANT	MERCHANT ADDRESS	MCC	REF NUMBER	AUTH	VTCOD	Flagged to Review	Reason Flagged for Review
9/22/2001	9/24/2001	\$4.00	WWW*EARTHLINK.NET	800-719-4660, GA 030309	4816	24692161265000746686438	865560	10	<input checked="" type="checkbox"/>	~32MERDS-D
10/23/2001	10/23/2001	(\$4.00)	WWW*EARTHLINK.NET	800-719-4660, GA 000000	4816	74798261296479826000000	0	65	<input checked="" type="checkbox"/>	~32MERDS-D
11/10/2001	12/26/2001	(\$26.96)	WWW*EARTHLINK.NET	800-719-4660, GA 000000	4816	74798261360000543688272	0	11	<input checked="" type="checkbox"/>	~32MERDS-D
11/10/2001	11/12/2001	\$26.96	WWW*EARTHLINK.NET	800-719-4660, GA 030309	4816	24692161314000543688273	265840	10	<input checked="" type="checkbox"/>	~32MERDS-D
12/3/2001	12/26/2001	(\$21.95)	WWW*EARTHLINK.NET	800-719-4660, GA 000000	4816	74798261360000496849566	0	11	<input checked="" type="checkbox"/>	~32MERDS-D
12/3/2001	12/4/2001	\$21.95	WWW*EARTHLINK.NET	800-719-4660, GA 030309	4816	24692161337000496849560	918020	10	<input checked="" type="checkbox"/>	~32MERDS-D
12/22/2001	12/24/2001	\$239.40	WWW*EARTHLINK.NET	800-719-4660, GA 030309	4816	24692161356000360366499	003780	10	<input checked="" type="checkbox"/>	~32MERDS-D
10/4/2000	10/5/2000	\$375.00	WOOD DINING SVCS #884	HANOVER, MO 021076	5812	24435650278206411016053	907350	10	<input type="checkbox"/>	
10/4/2000	10/5/2000	\$122.55	WOOD DINING SVCS #884	HANOVER, MO 021076	5812	24435650278206411016061	220100	10	<input type="checkbox"/>	

# Way Ahead

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- Set up working group to see where the OIG community is with forensic audit and automated oversight
- Offer assistance to OIGs on development and expansion of capabilities