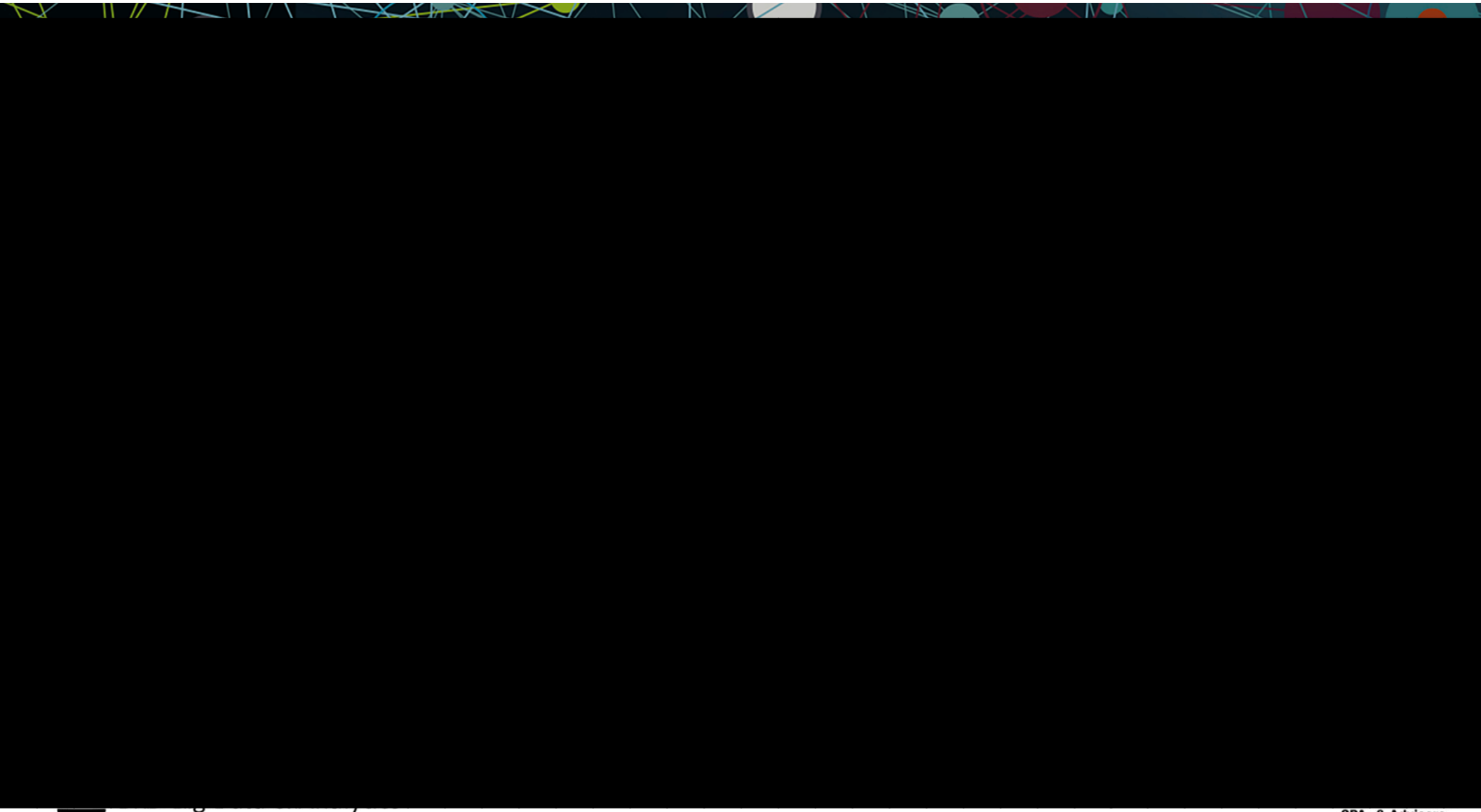
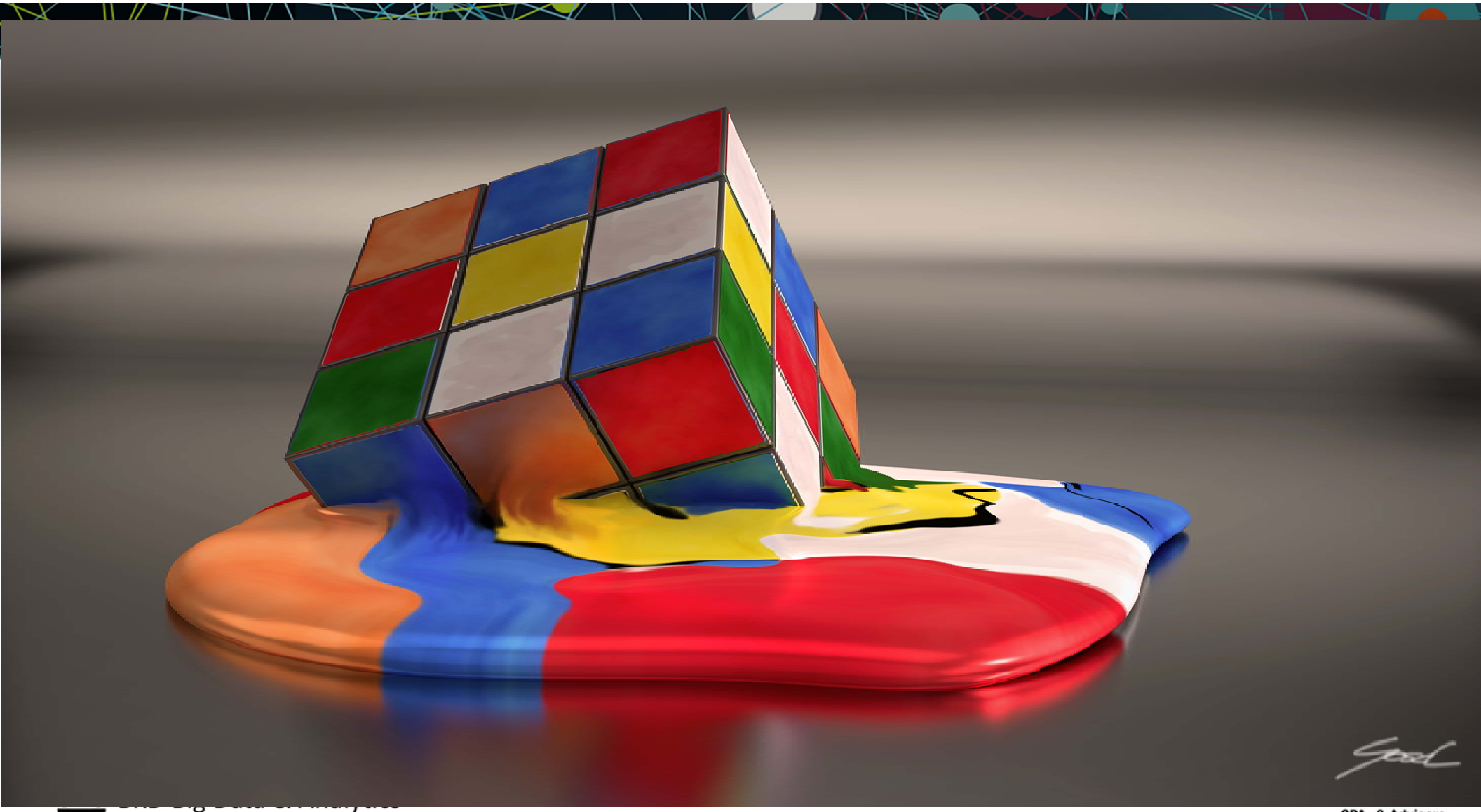
Data Analytics – How To Do It Right

Presented by:

Bryan Callahan, CPA/CFF, CFE, CVA

Partner – Big Data & Analytics, Digital Forensics





We Need a New Perspective

Source: https://nsa.gov1.info/utah-data-center/udc-photo.html

Building a Foundation

Definition of big data:

Lots of options – pick your favorite

More importantly:

You have data – lots of it – and need to be using it

Definition of analytics:

… analysis methods designed to extract **useful information** *for* **answering strategic questions** *…*

It's not just transactions …

Communicative

Social

Emotional

Data Universe

Created in last 2 years: 90%

Emerging Technologies

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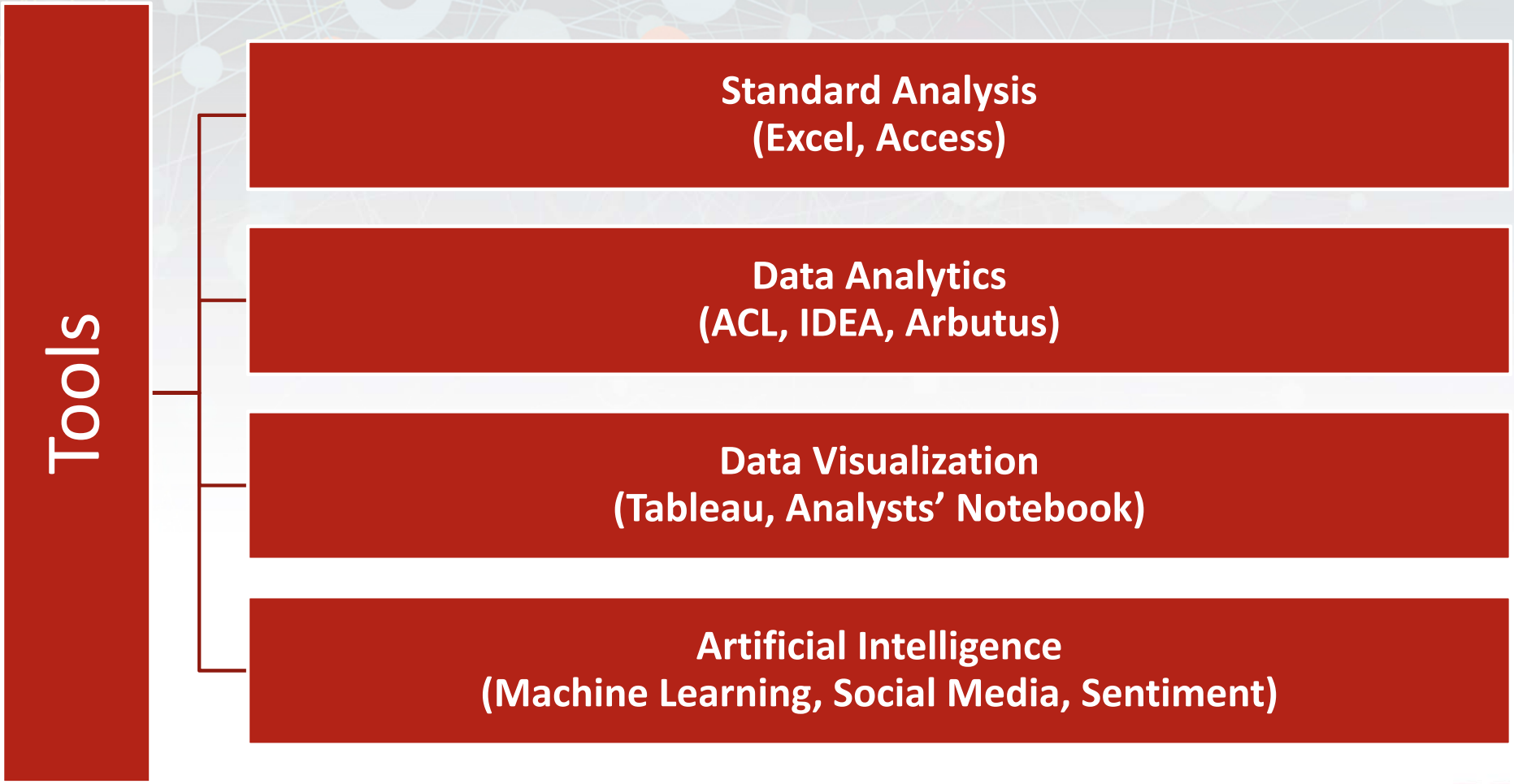
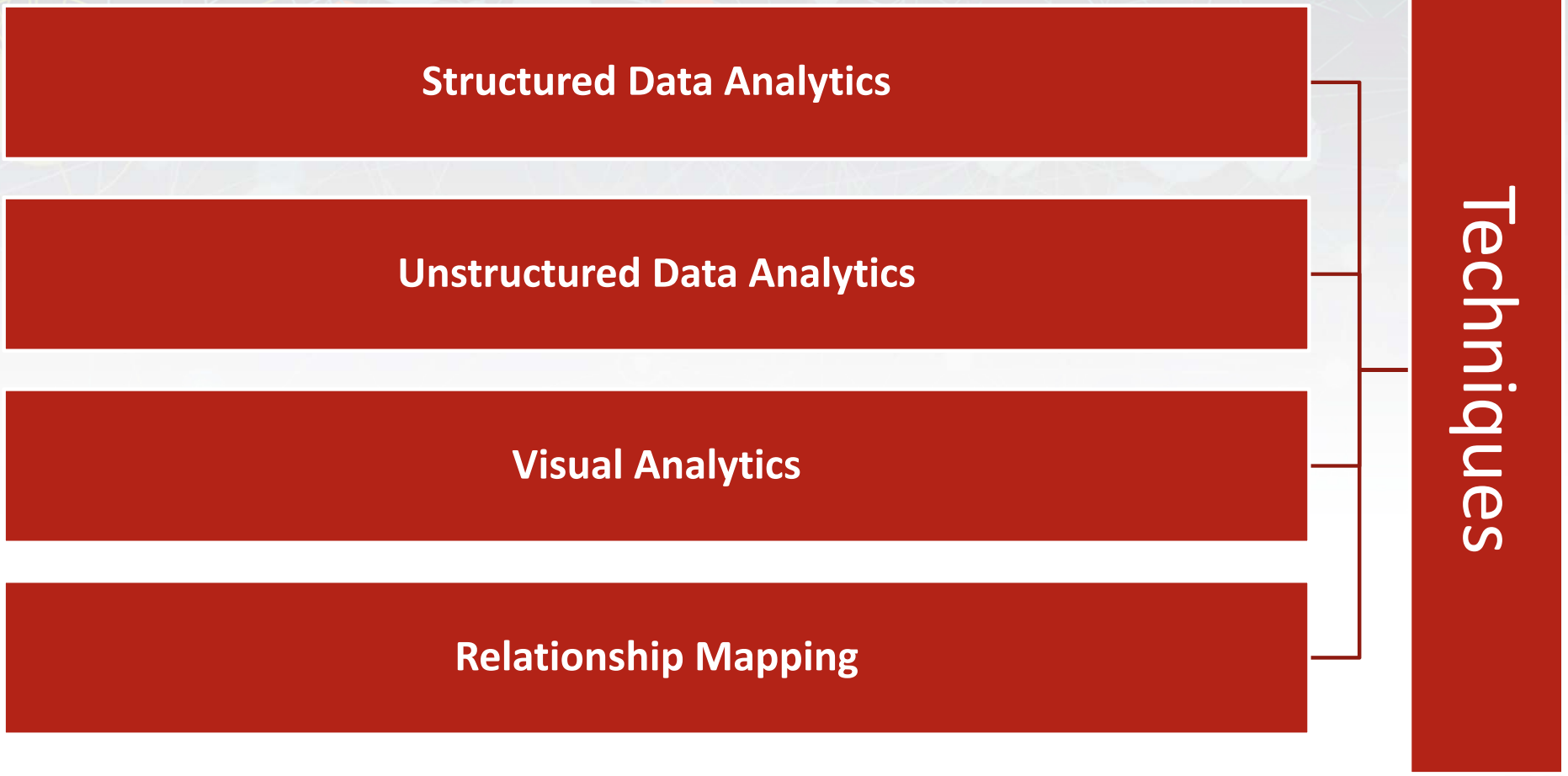
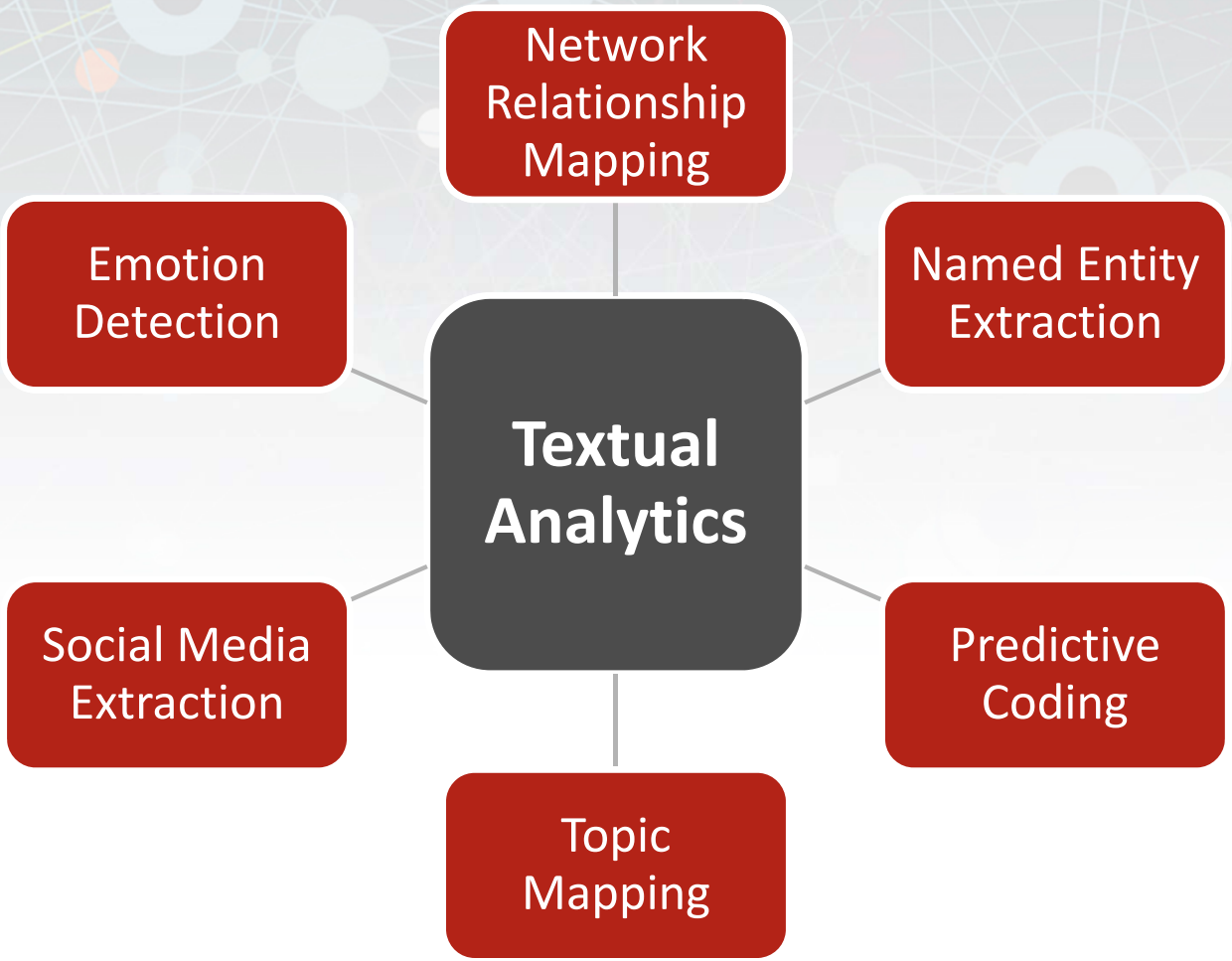
BKD LLP
CPAs & Advisors


Tools
Standard Analysis
(Excel, Access)
Data Analytics
(ACL, IDEA, Arbutus)
Data Visualization
(Tableau, Analysts' Notebook)
Artificial Intelligence
(Machine Learning, Social Media, Sentiment)

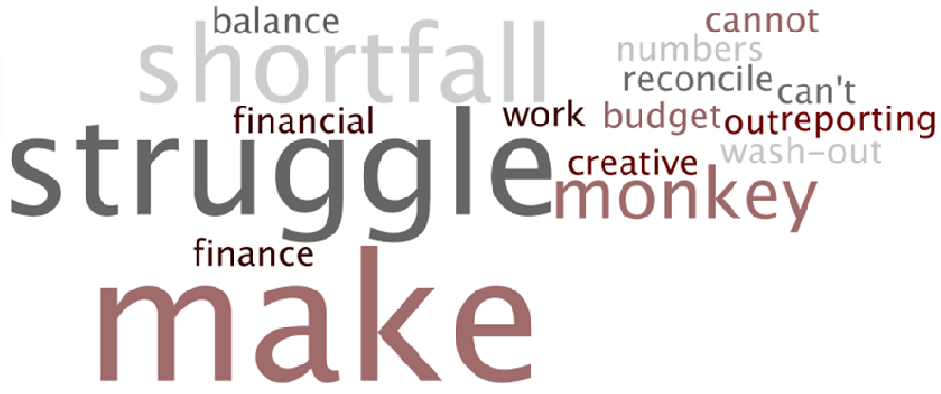

Structured Data Analytics
Unstructured Data Analytics
Visual Analytics
Relationship Mapping
Techniques

Technologies on the Digital Horizon

- Textual analytics
- Machine learning
  - Supervised
  - Unsupervised
- Advanced analytics
  - Regression
  - Predictive


Network Relationship Mapping
Emotion Detection
Named Entity Extraction
Textual Analytics
Social Media Extraction
Predictive Coding
Topic Mapping

directors
generate
deadline
committee
financial
reports
finance
balance
numbers
cleanup
audit
finish
reconcile
tune
reporting
board

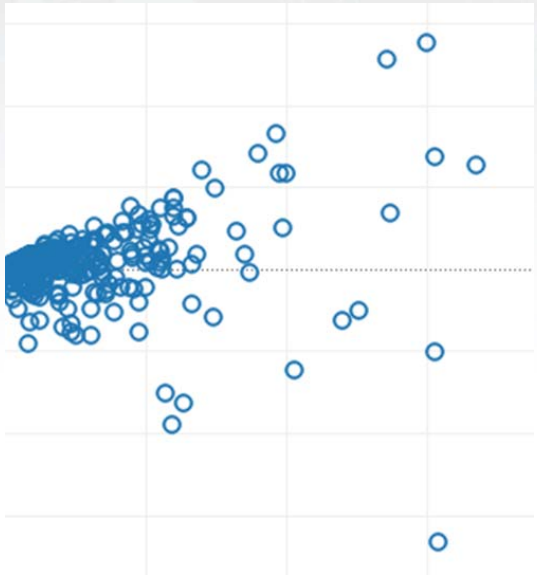

balance
shortfall
cannot
numbers
reconcile
can't
financial
work
budget
outreporting
wash-out
creative
struggle
monkey
finance
make

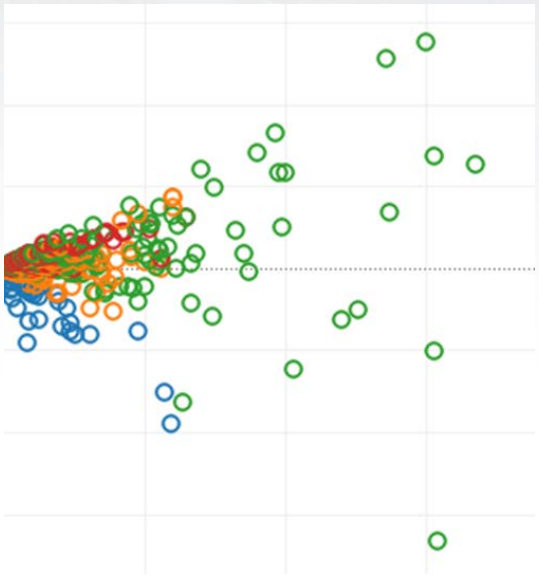
Machine Learning

Machine Learning

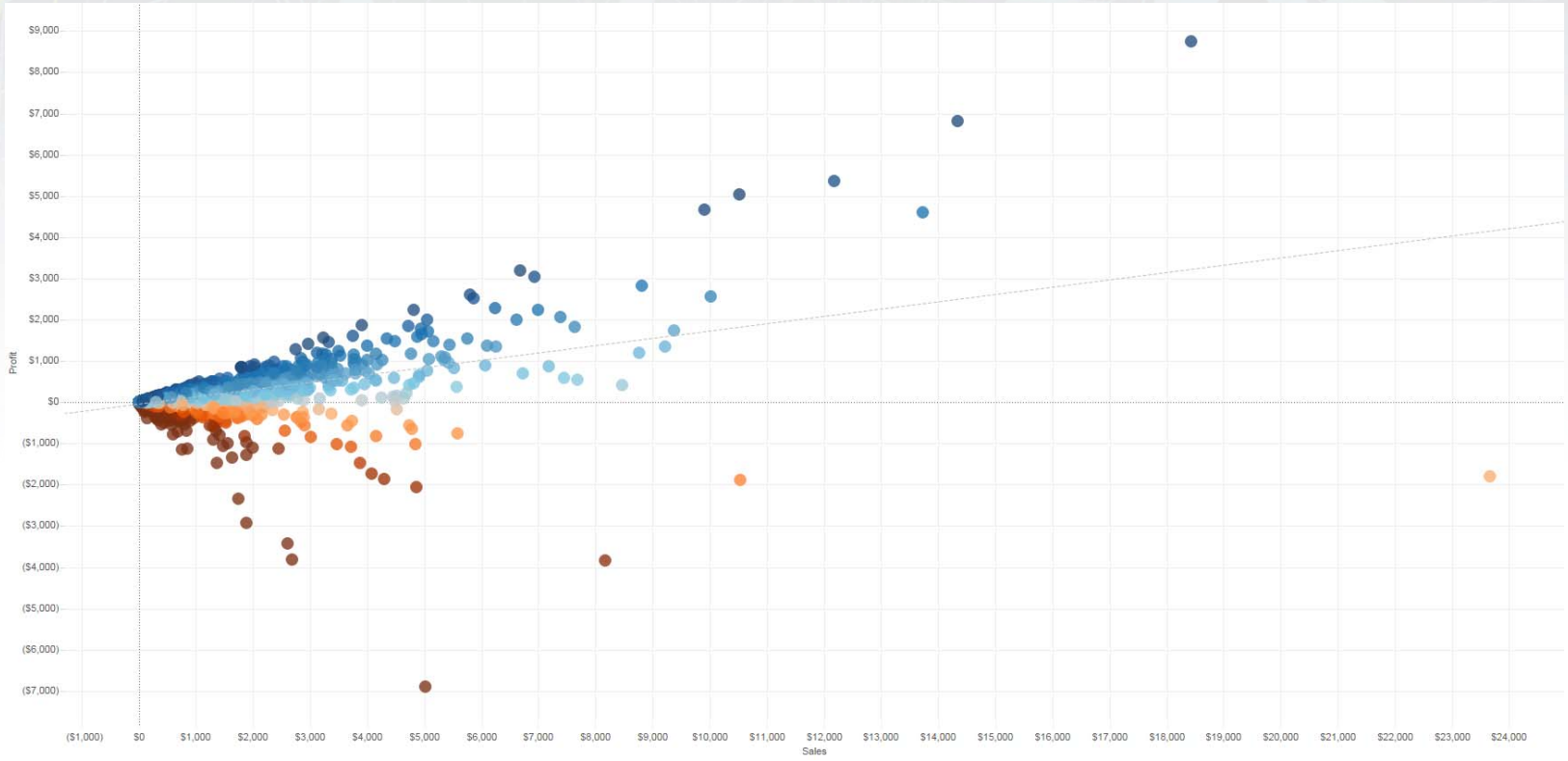
Supervised	Unsupervised
Give examples and answers, machine finds more like it	Give data, machine finds patterns and applies its own rules

Machine Learning: Clustering

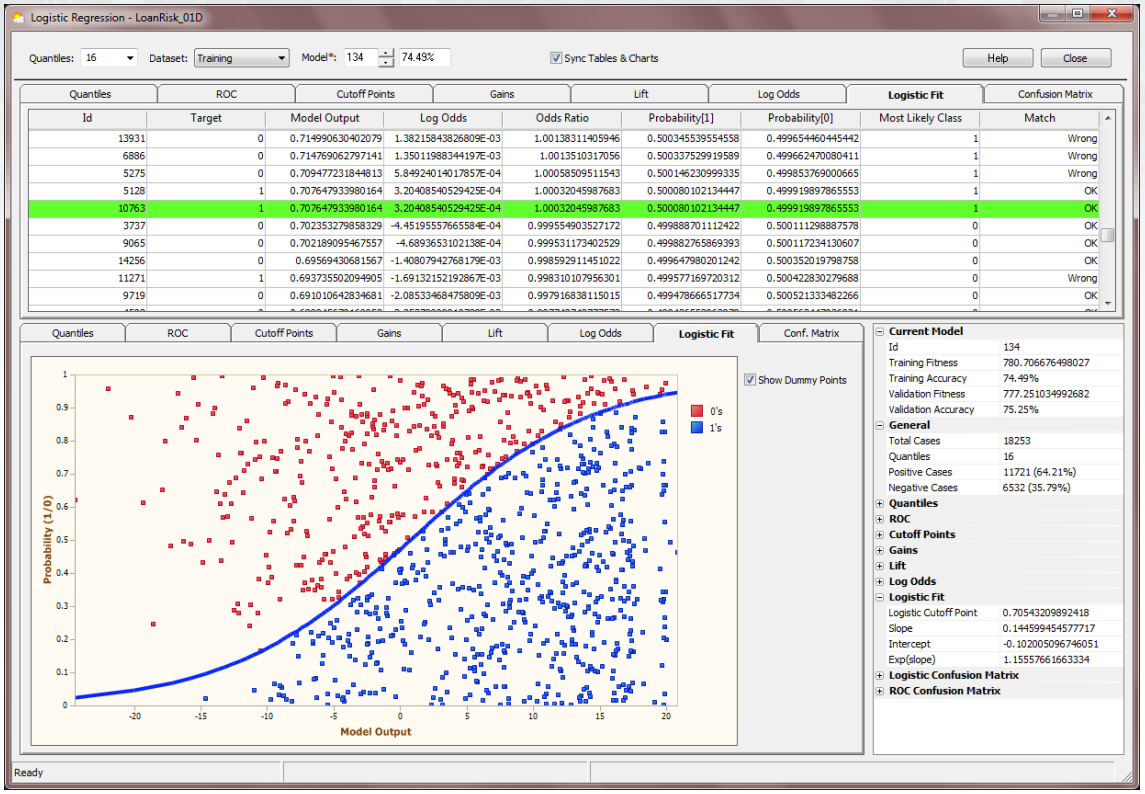




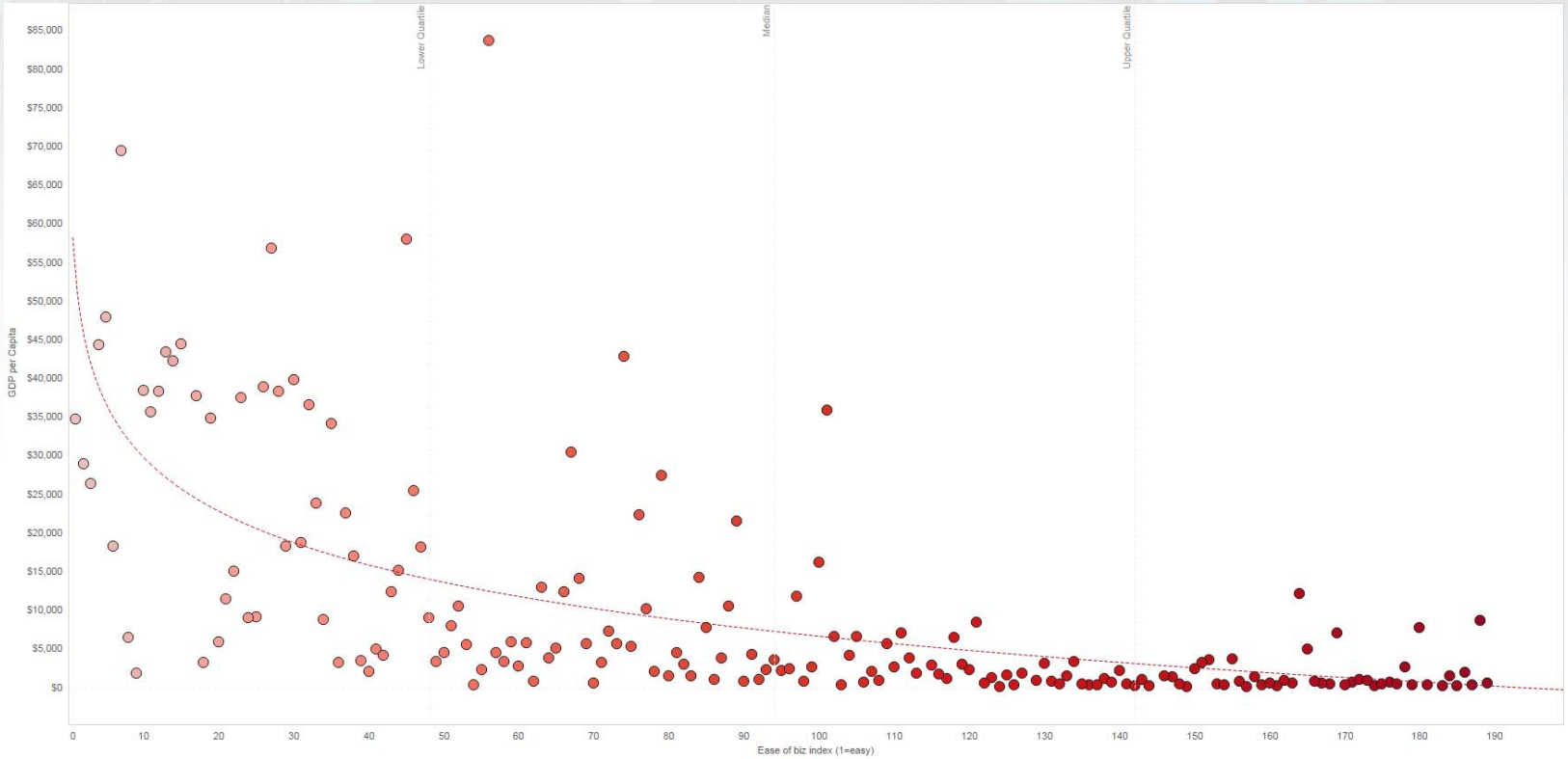
Advanced Analytics: Outlier Detection



Advanced Analytics: Logistic Regression



Advanced Analytics: Correlation



Challenge #2:

How will you apply emerging technologies to everyday problems?

Application Examples

Fraud Risk Management

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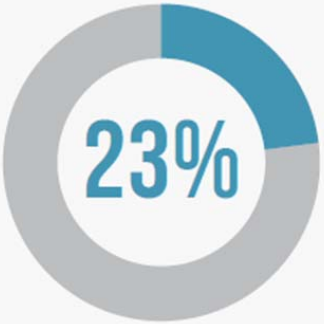
$6.3 BILLION
IN TOTAL LOSSES



OF CASES CAUSED LOSSES OF
$1 MILLION OR MORE

$150,000
MEDIAN LOSS PER CASE

Figure 45: Frequency of Schemes Based on Industry

Industry/Scheme	Banking and Financial Services	Government and Public Administration	Manufacturing	Health Care	Education	Retail	Construction	Insurance	Oil and Gas	Technology	Services (Other)	Transportation and Warehousing	Telecommunications	Services (Professional)	Religious, Charitable, or Social Services
Cases	368	229	192	144	132	104	86	85	74	74	70	68	62	60	52
Billing	9.5%	25.3%	32.8%	31.3%	34.1%	15.4%	27.9%	17.6%	20.3%	29.7%	22.9%	22.1%	12.9%	26.7%	25.0%
Cash Larceny	11.1%	7.9%	5.2%	9.7%	13.6%	12.5%	8.1%	4.7%	4.1%	5.4%	15.7%	4.4%	1.6%	13.3%	9.6%
Cash on Hand	17.9%	10.5%	8.3%	11.1%	17.4%	11.5%	7.0%	4.7%	9.5%	8.1%	22.9%	5.9%	4.8%	20.0%	13.5%
Check Tampering	9.5%	9.2%	13.5%	14.6%	7.6%	9.6%	10.5%	17.6%	4.1%	5.4%	18.6%	10.3%	6.5%	31.7%	25.0%
Corruption	37.5%	38.4%	48.4%	30.6%	31.8%	32.7%	36.0%	28.2%	48.6%	44.6%	28.6%	51.5%	41.9%	16.7%	28.8%
Expense Reimbursements	5.4%	15.7%	22.9%	20.1%	15.9%	8.7%	20.9%	9.4%	10.8%	27.0%	12.9%	8.8%	19.4%	16.7%	25.0%
Financial Statement Fraud	12.0%	7.9%	10.9%	13.2%	5.3%	5.8%	17.4%	7.1%	6.8%	12.2%	17.1%	5.9%	9.7%	11.7%	3.8%
Non-Cash	10.6%	14.8%	30.2%	13.2%	17.4%	32.7%	22.1%	5.9%	17.6%	18.9%	22.9%	29.4%	38.7%	10.0%	13.5%
Payroll	3.8%	13.5%	11.5%	9.7%	7.6%	3.8%	16.3%	5.9%	8.1%	2.7%	11.4%	7.4%	3.2%	11.7%	13.5%
Register Disbursements	2.7%	1.7%	5.7%	2.1%	1.5%	8.7%	1.2%	0.0%	0.0%	1.4%	5.7%	2.9%	3.2%	1.7%	1.9%
Skimming	6.8%	14.0%	8.3%	12.5%	25.0%	17.3%	15.1%	10.6%	8.1%	5.4%	21.4%	11.8%	6.5%	18.3%	19.2%

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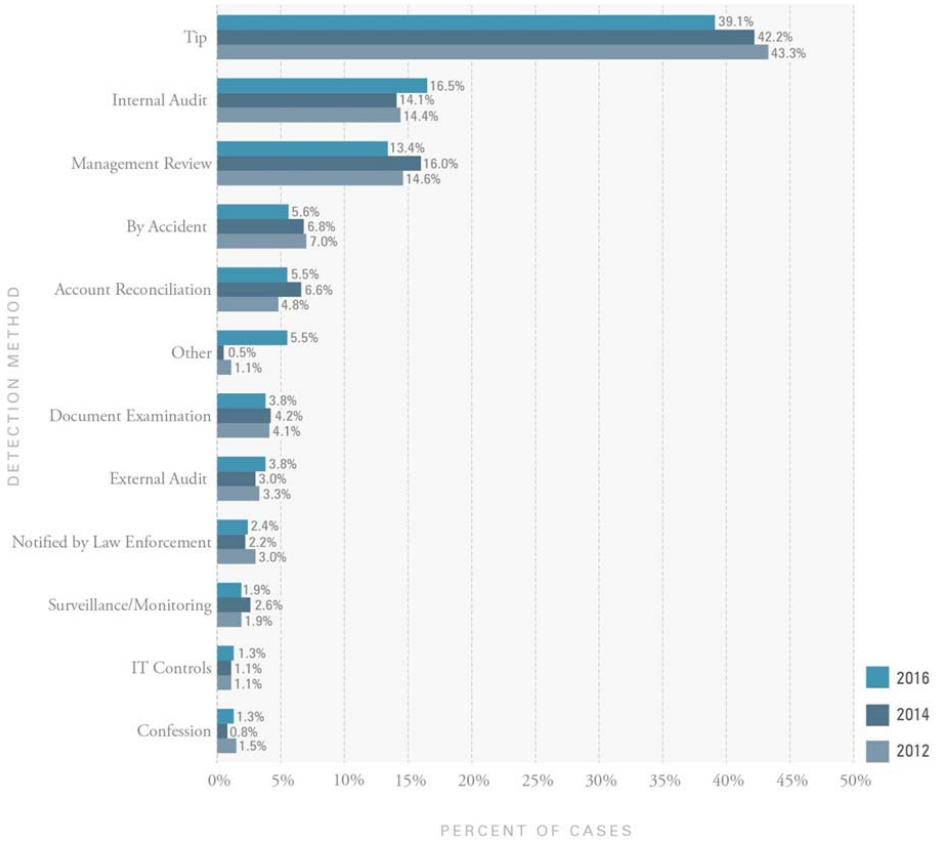
Figure 21: Initial Detection of Occupational Frauds



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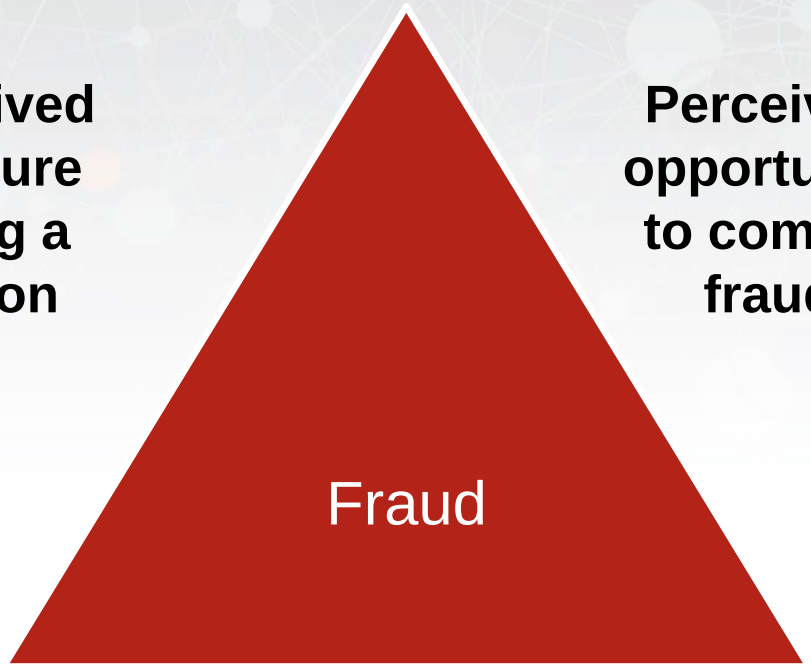
Fraud Triangle



Vendor Information							Employee Information	
Vendor TIN	Vendor nu	[redacted]	[redacted]	Total Amount Paid from January 04 to July 2005	Street	Region	NAME	ADDRESS1
227620426	454385			no activity	605 HIGHLAND AVE SW			605 Highland Ave Sw
241720797	437069			$ 3,786.00	3139 BECKS CHURCH RD			3139 Becks Church Rd.
243464534	509775			**$167,708.00**	**315 RIDGECREST DRIVE**			**315 Rigdecrest Dr.**
250085378	434913			no activity	436 EAST TIERRA DR			436 E. Tierra
255398736	497638			$ 1,748.00	1247 DEE KENNEDY RD			1247 Deen Kennedy Rd
259869739	525761			$ 70.00	1510 LITTLE RIVER DRIVE			1510 Littleriver Dr
260159762	443860			**$ 13,042.00**	**151 MONTGOMERY RD**			**151 Montgomery Road**
265960806	445631			$ 2,472.00	1204 FIR STREET			1204 Fir Street
292649087	496812			$ 225.00				P.O. Box 141
294847554	473441			no activity	5825 CROSSINGS BLVD #216			680 Lake Terrace Drive
319729230	424820			$ 920.00	876 LIBERTY STREET			612 California Avenue

Vendor addresses match employee addresses

Mailbox Service Comparison

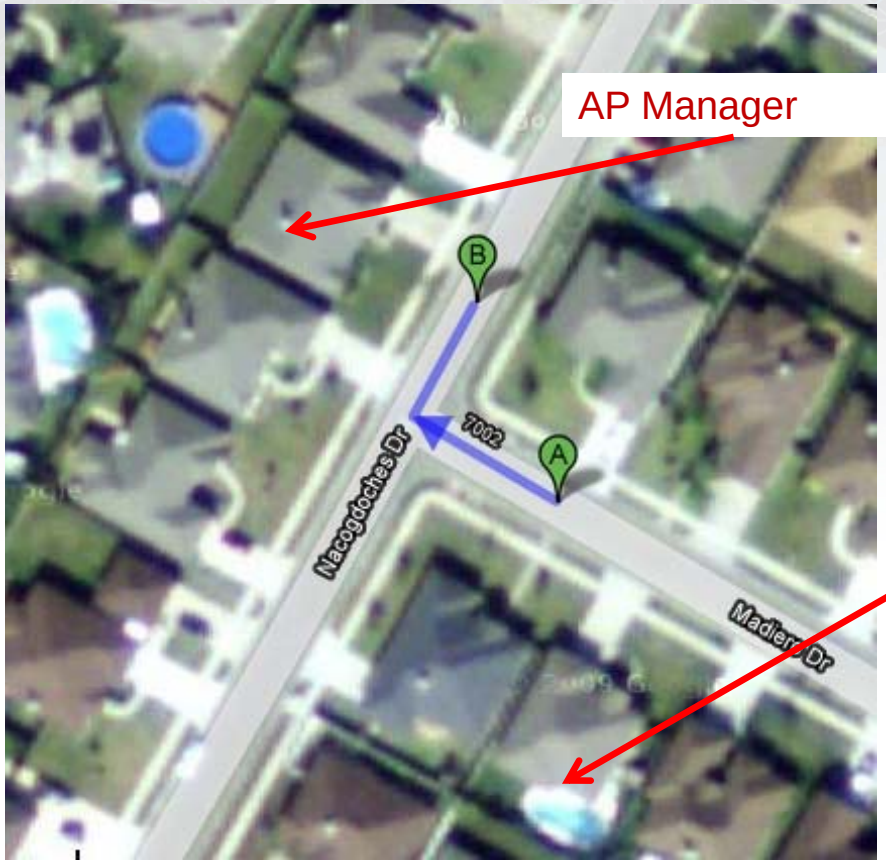
Name	Address	City	State	ZIP	FLAG
Syntec Corporation	1221 East Kearney	Springfield	MO	65601	MATCH

UPS Store
1221 East Kearney
Springfield, MO 65801

Latitude/Longitude Comparison

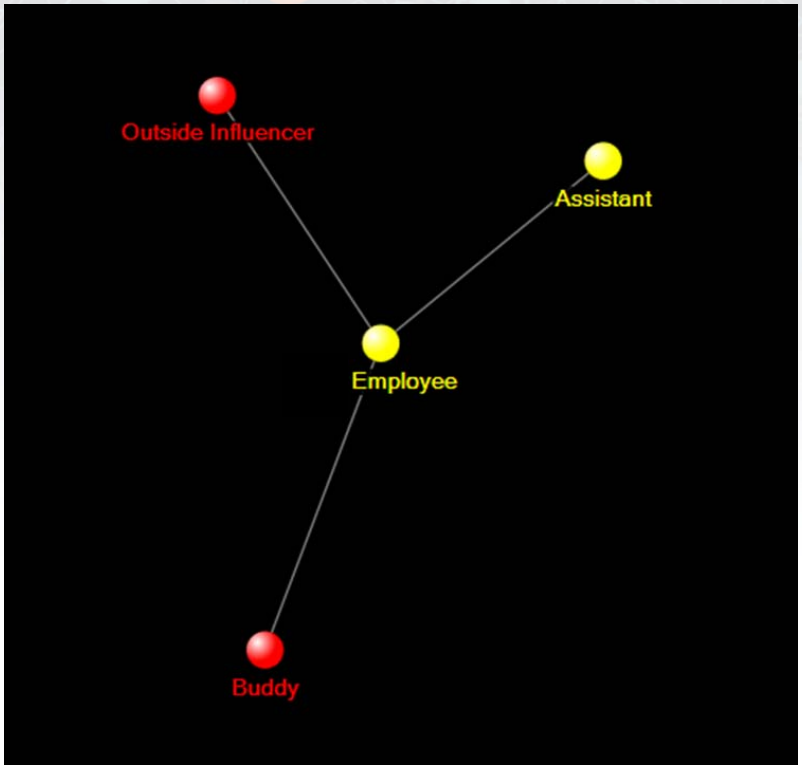
Name	Address	City	State	ZIP	LAT	LONG
AP Clerk	312 East Warwick	Springfield	MO	65807	37.320552	-93.583655
Syntec Corporation	1221 East Kearney	Springfield	MO	65807	37.320289	-93.583836

965 feet

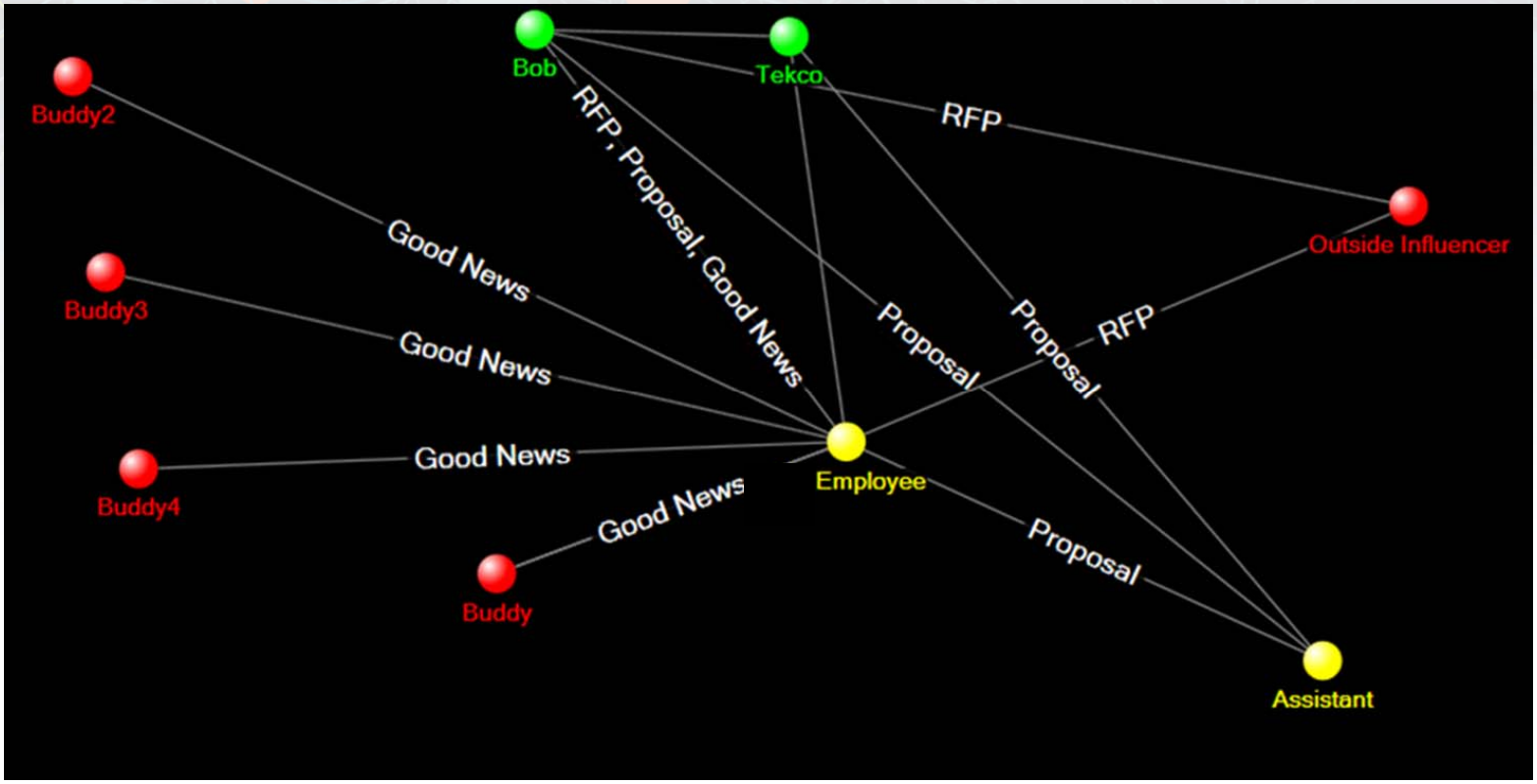

AP Manager
B
A
7062
Nacogdoches Dr
Madiera Dr
Vinny's
Salvage
Yard

Corruption Risk – RFPs/Purchasing

Date	To	From	Subject	Message Body
3/21/2013	Outside Influencer	City Employee	RFP	What are your thoughts on awarding the contract to Bob?
3/23/2013	Assistant	City Employee	Proposals	I've looked through the proposals, and think Bob and his company are the only logical choice. Outside Influencer agrees Tekco is the best choice.
4/2/2013	Buddy	City Employee	Good News	Hey, we're going to steer this to Bob and Tekco, he's gonna need subs for the jobs - let Buddy2, Buddy3 and Buddy4 know so they can be ready to jump in.


Outside Influencer
Assistant
Employee
Buddy

Date	To	From	Subject	Message Body	Named Entity Extraction
3/21/2013	Outside Influencer	City Employee	RFP	What are your thoughts on awarding the contract to Bob?	Bob
3/23/2013	Assistant	City Employee	Proposals	I've looked through the proposals, and think Bob and his company are the only logical choice. Outside Influencer agrees Tekco is the best choice.	Bob, Outside Influencer, Tekco
4/2/2013	Buddy	City Employee	Good News	Hey, we're going to steer this to Bob and Tekco, he's gonna need subs for the jobs - let Buddy2, Buddy3 and Buddy4 know so they can be ready to jump in.	Bob, Tekco, Buddy2, Buddy3, Buddy4


Bob
Tekco
Buddy2
RFP
RFP, Proposal, Good News
Outside Influencer
Good News
Buddy3
Proposal
Proposal
RFP
Good News
Good News
Buddy4
Employee
Good News
Proposal
Buddy
Assistant

Reputational Risk Management

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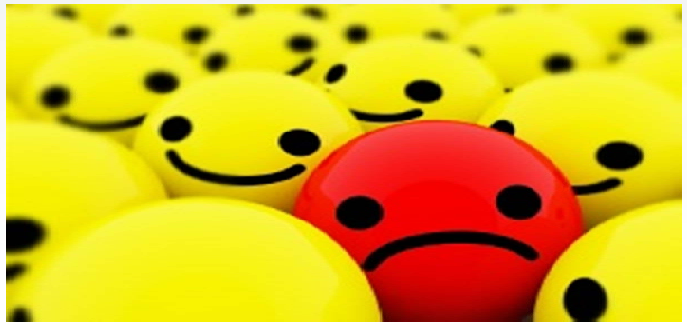
Managing Your Reputation

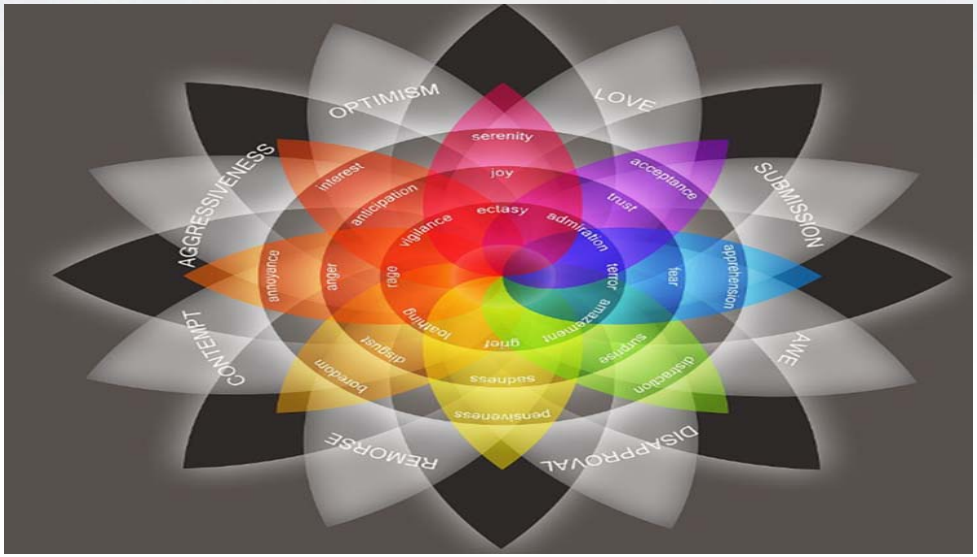
- How are you viewed in the market?
- What are your customers saying?
- What can you do to control the conversation?

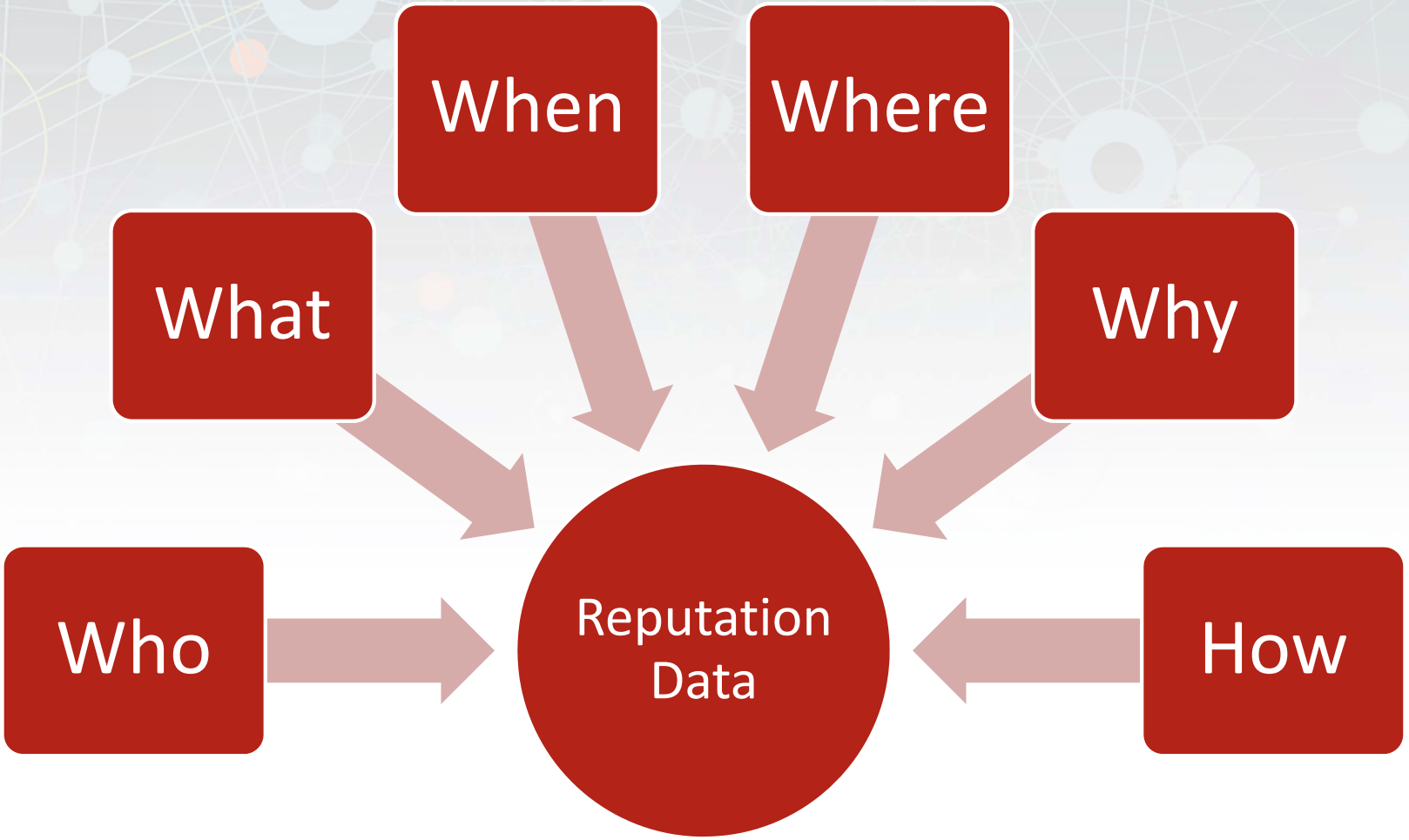
Emotions: Sentiment

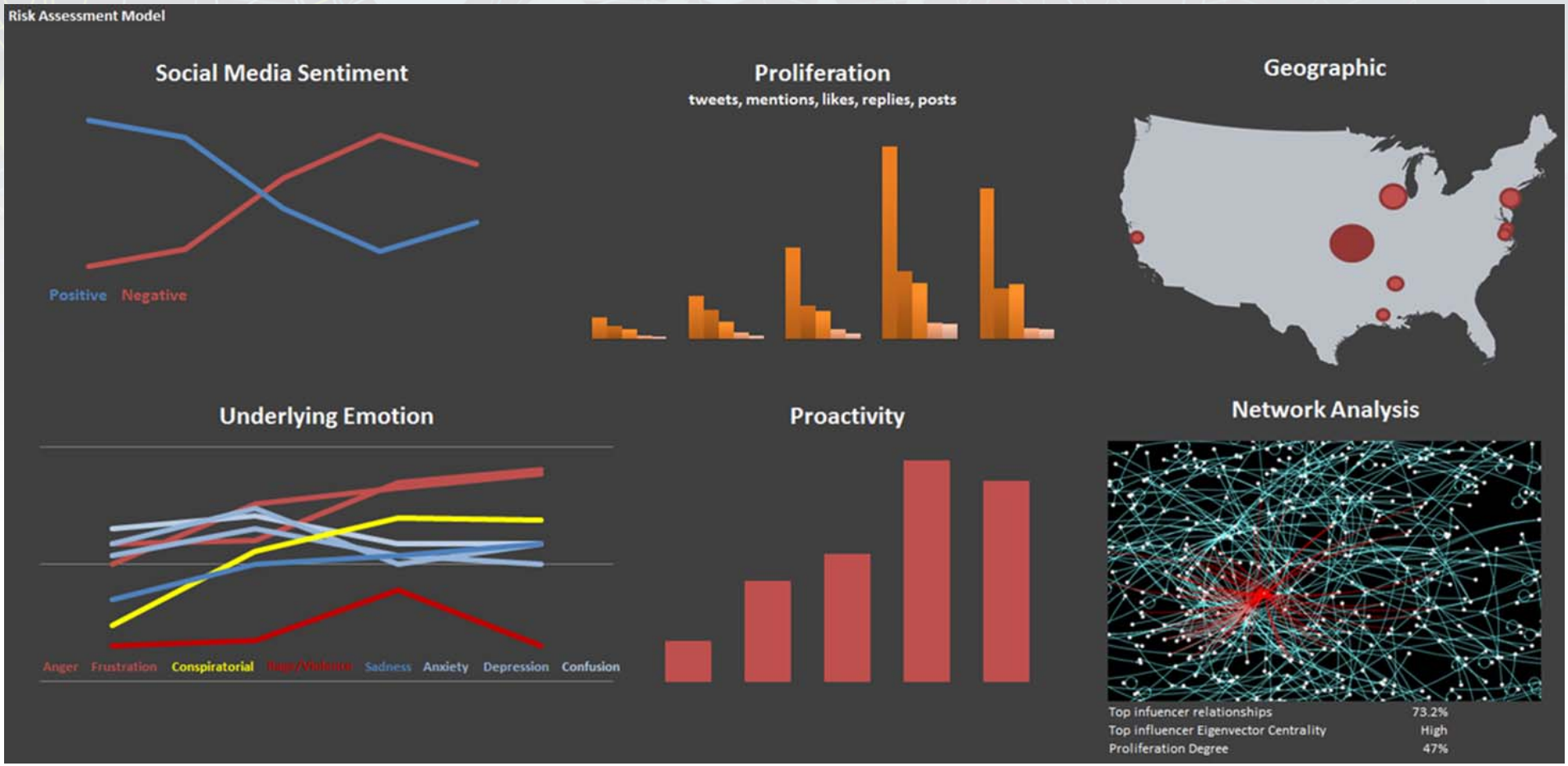


Emotions: Tone Detection

- Anger
- Frustration
- Anxiety
- Tension
- Evasive
- Conspiratorial
- Sadness
- Intimacy
- Joy
- Sadness




When
Where
What
Why
Who
Reputation Data
How


Risk Assessment Model
Social Media Sentiment
Positive
Negative
Proliferation
tweets, mentions, likes, replies, posts
Geographic
Underlying Emotion
Anger
Frustration
Conspiratorial
Hate/Violence
Sadness
Anxiety
Depression
Confusion
Proactivity
Network Analysis
Top infuencer relationships 73.2%
Top influencer Eigenvector Centrality High
Proliferation Degree 47%

Application Framework

The Three V's for Identifying Opportunities

1. Viable
   - Problem is suited to available tools
2. Valuable
   - Is it worth doing?
3. Vital
   - Technology is key to success

Strategic Question

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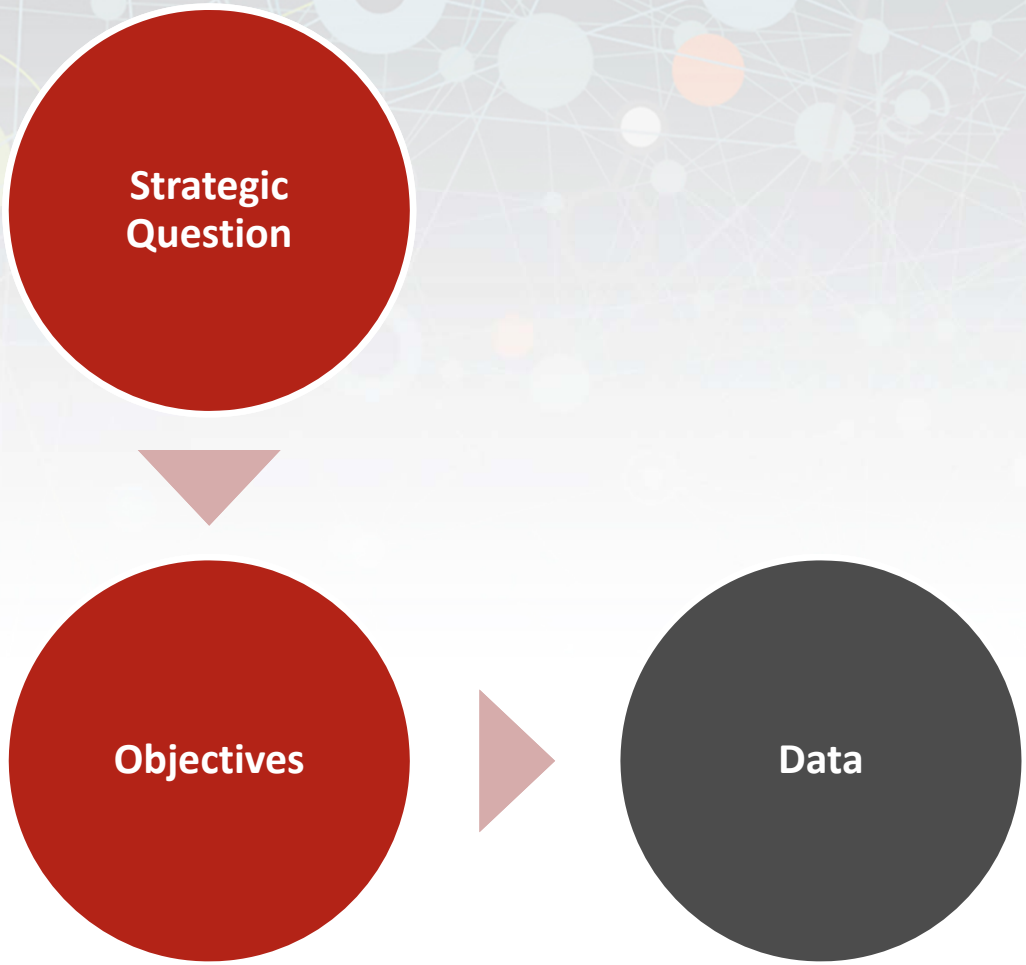
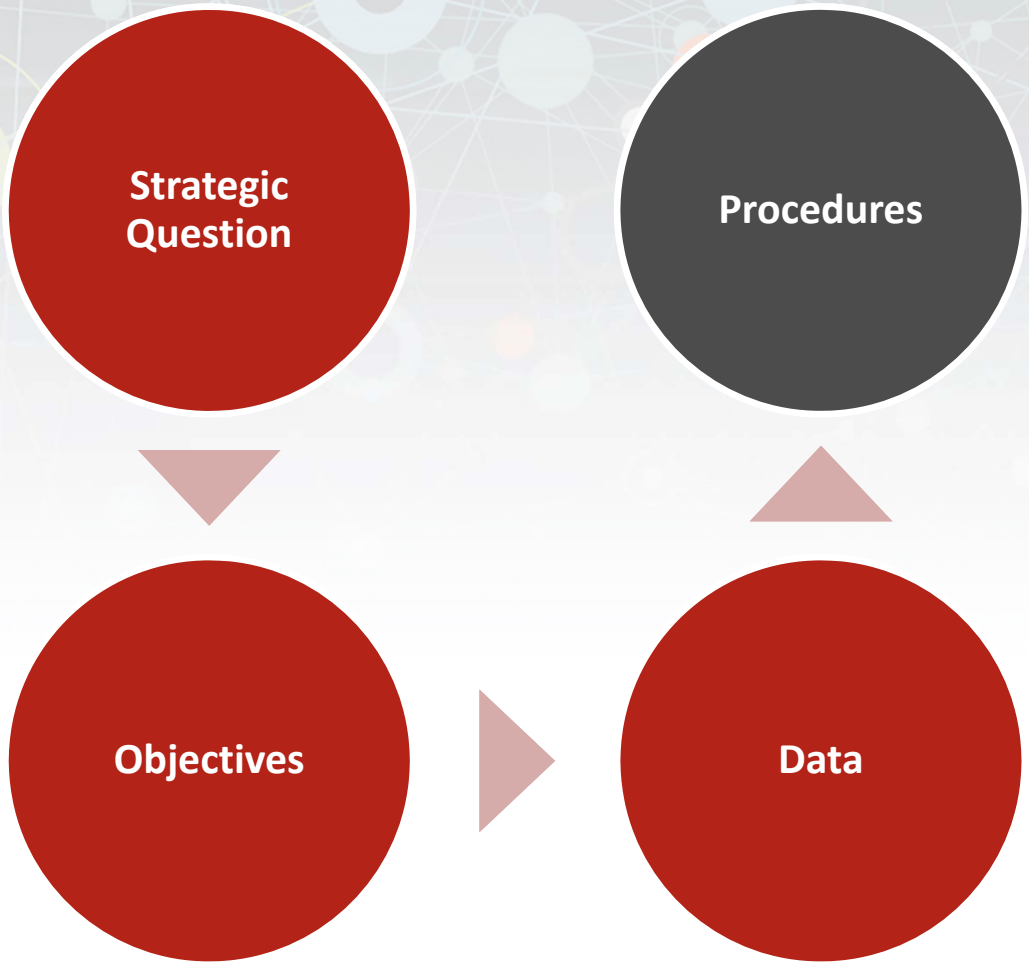
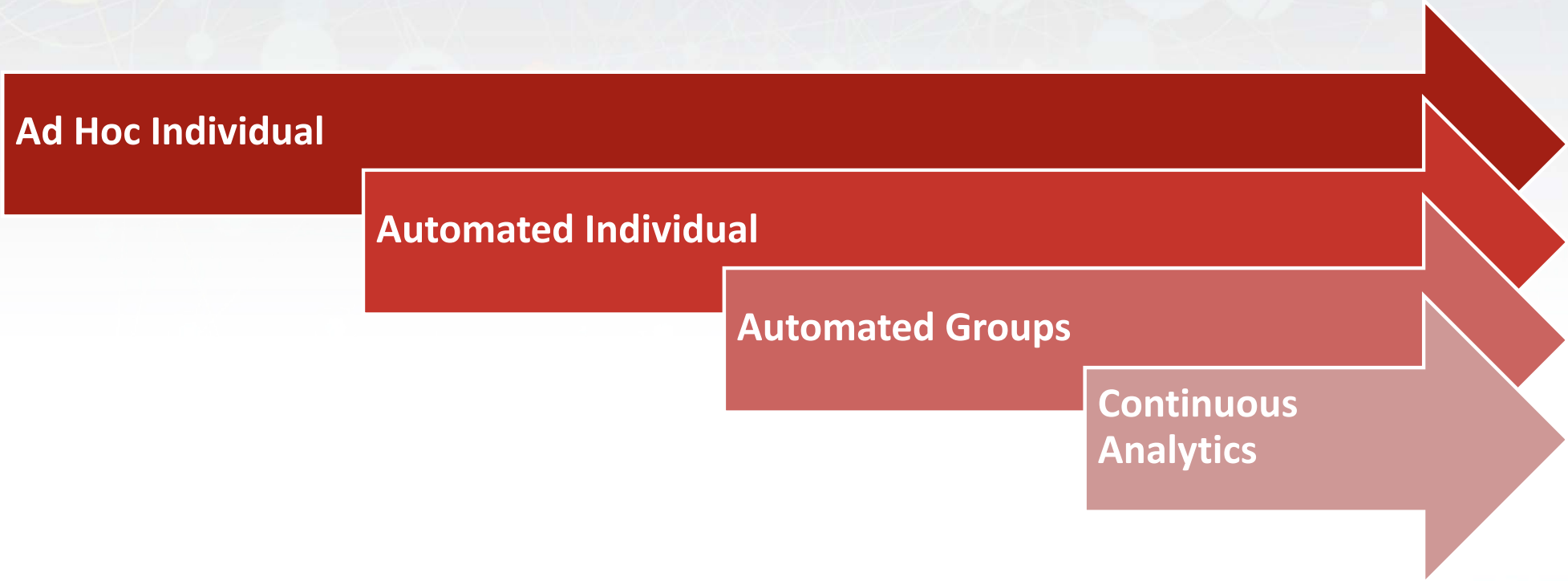
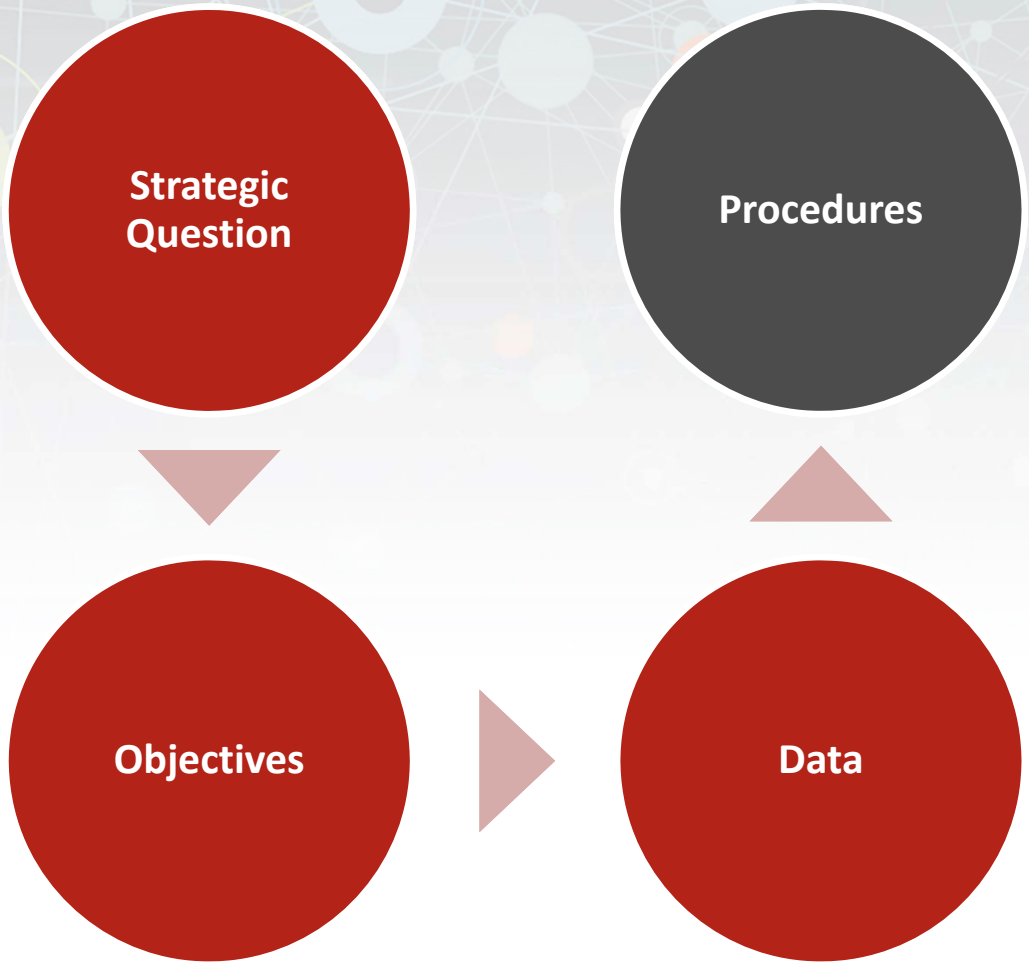
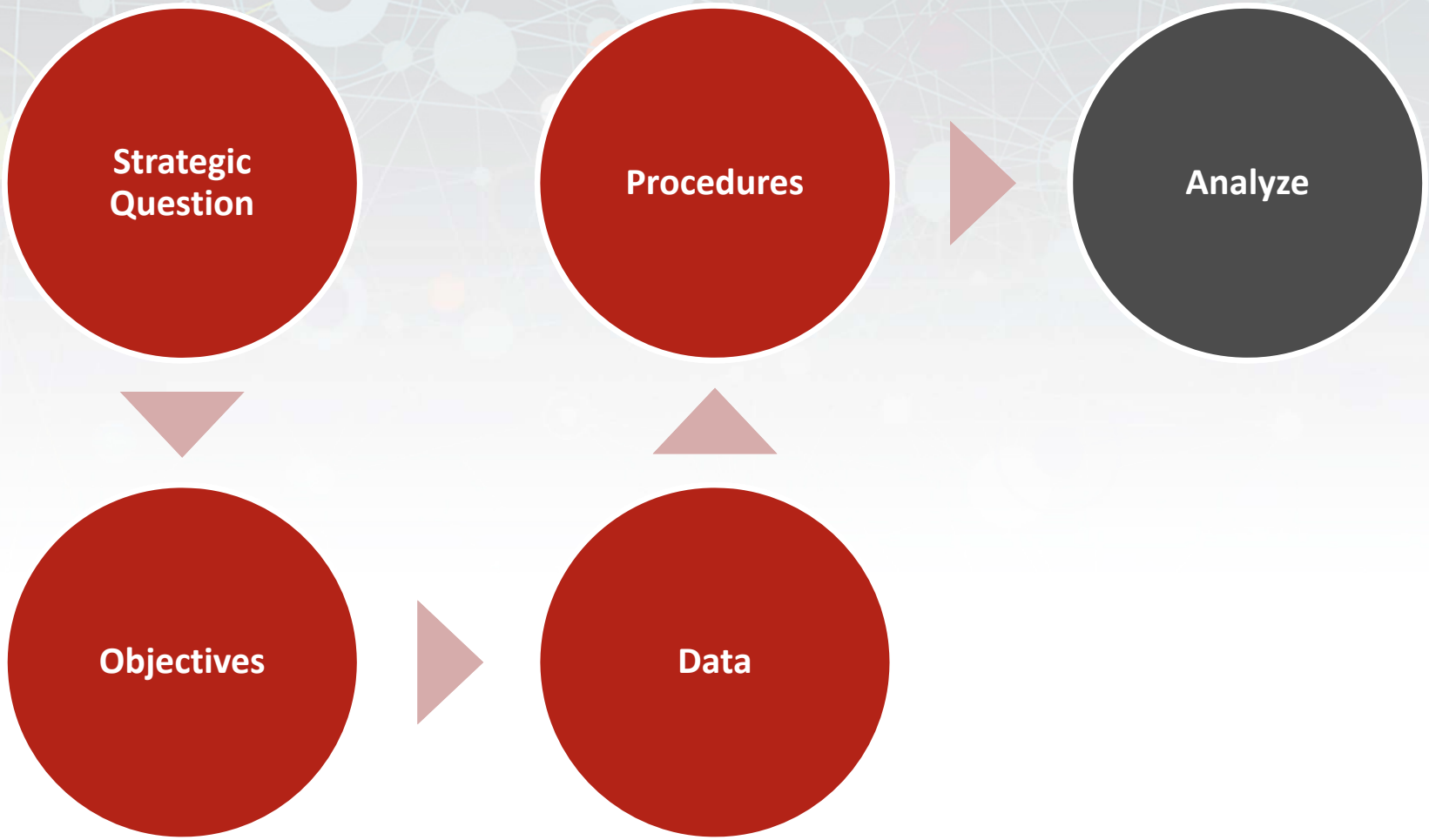

Strategic Question
Objectives
Data

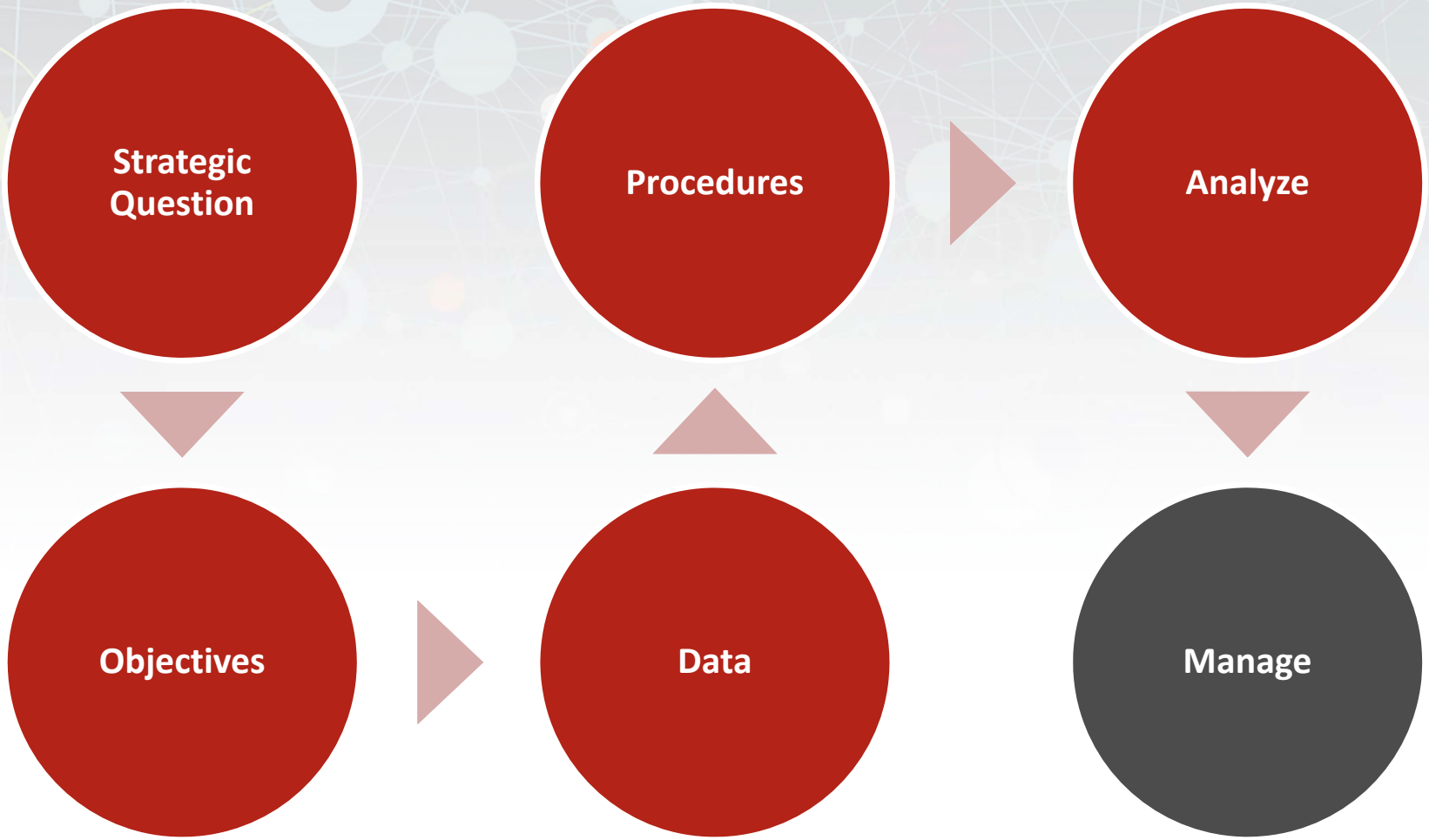

Strategic Question
Procedures
Objectives
Data

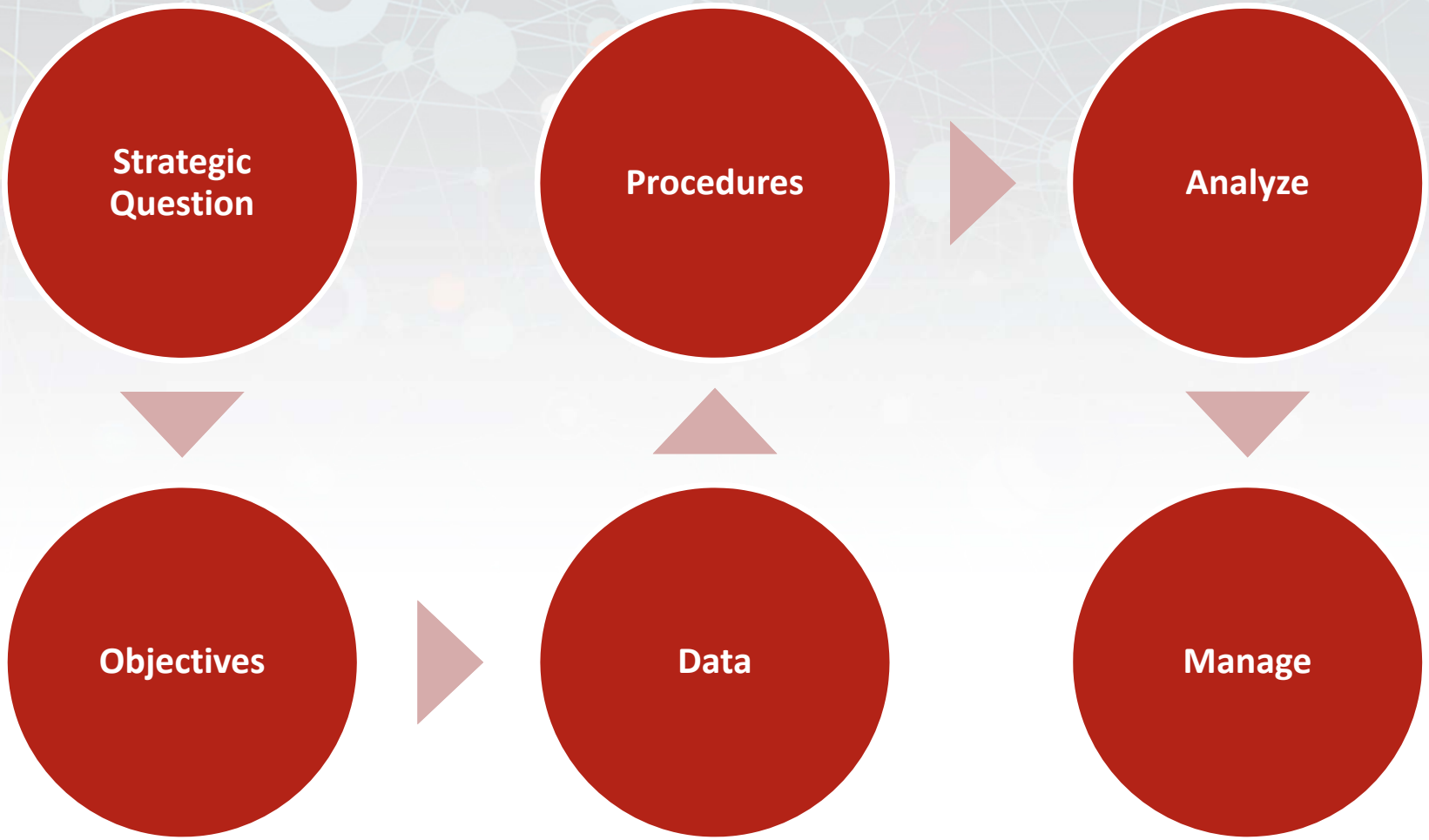
Procedure Development




Strategic Question
Procedures
Objectives
Data


Strategic Question
Procedures
Analyze
Objectives
Data


Strategic Question
Procedures
Analyze
Objectives
Data
Manage


Strategic Question
Procedures
Analyze
Objectives
Data
Manage

Data Communication Principles

“ ”

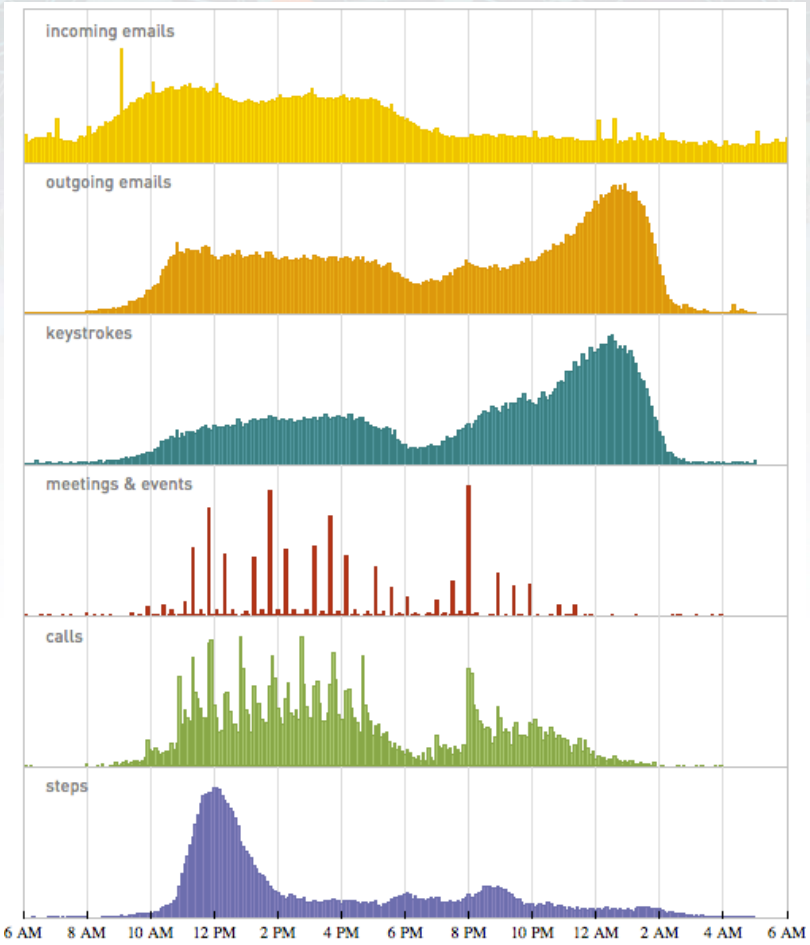
Data communication is more about communication and less about data.

Guiding Principle

What is the Purpose of Your Communication?

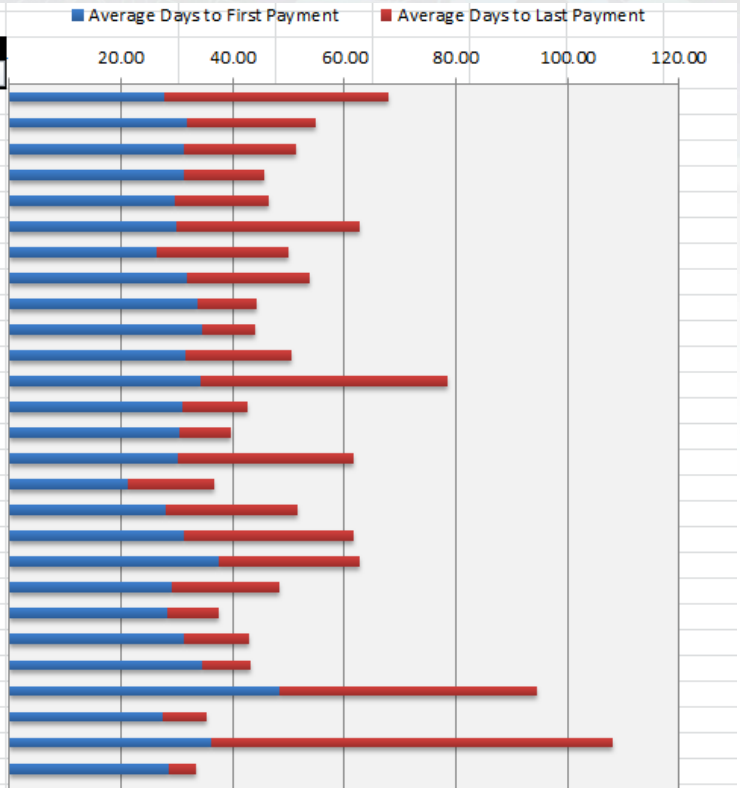
1. Educate
2. Explain
3. Entertain

Educate


incoming emails
outgoing emails
keystrokes
meetings & events
calls
steps
6 AM
8 AM
10 AM
12 PM
2 PM
4 PM
6 PM
8 PM
10 PM
12 AM
2 AM
4 AM
6 AM

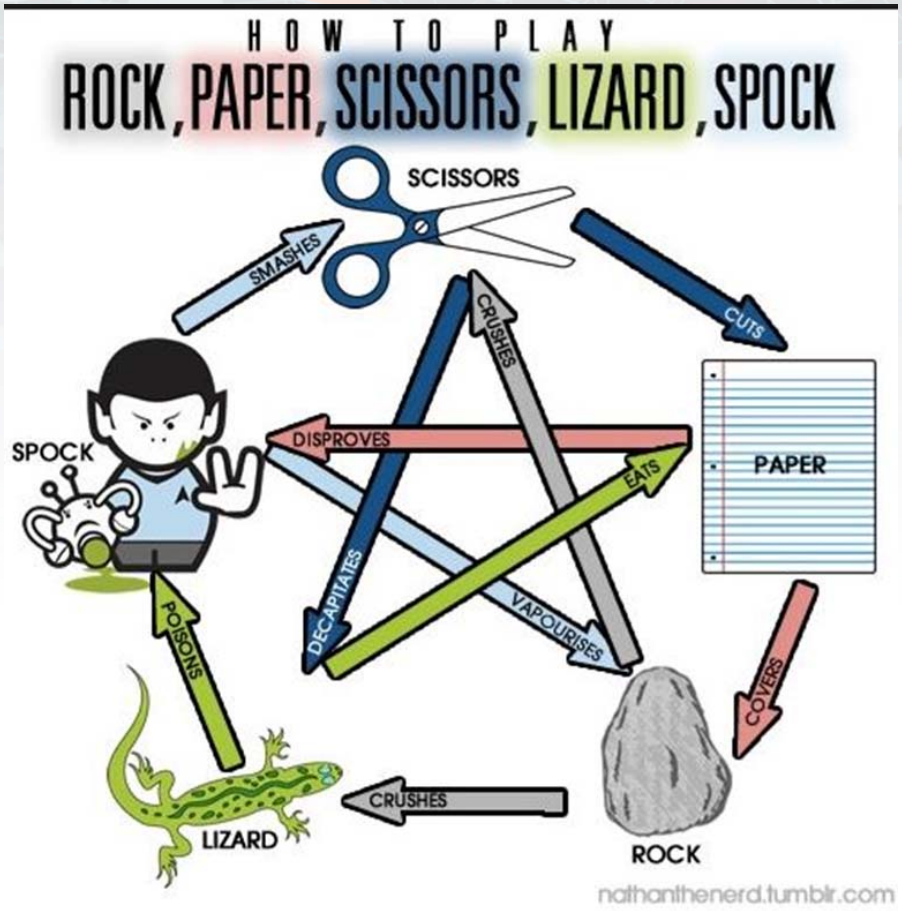
Explain

Total Charge	Transaction Count	Average Days to First Payment	Average Days to Last Payment
$61,198,693.46	312,407	27.81	68.07
1,071,269.87	6,048	31.78	54.96
345,120.02	1,835	31.17	51.35
220,001.47	1,324	31.20	45.78
219,531.43	1,230	29.74	46.43
191,377.07	1,092	29.93	62.87
137,157.64	808	26.51	50.05
115,154.22	615	31.79	53.80
113,714.57	661	33.74	44.43
107,200.31	548	34.43	44.01
84,356.45	440	31.68	50.69
81,212.19	583	34.36	78.40
72,465.86	379	31.00	42.61
63,481.15	307	30.50	39.66
45,047.81	222	30.22	61.69
38,663.72	275	21.36	36.79
34,560.46	182	27.91	51.73
34,044.56	194	31.22	61.64
31,053.63	168	37.43	62.86
30,353.82	179	29.21	48.27
26,476.08	184	28.24	37.64
26,163.74	118	31.36	42.92
24,736.48	143	34.58	43.23
24,621.45	117	48.28	94.56
21,116.12	140	27.45	35.39
19,773.02	137	36.20	108.05
19,444.95	99	28.59	33.37



Explain (Cont.)

Entertain


HOW TO PLAY
ROCK, PAPER, SCISSORS, LIZARD, SPOCK
SCISSORS
SMASHES
CUTS
CRUSHES
SPOCK
DISPROVES
PAPER
EATS
DECAPITATES
VAPOURISES
POISONS
COVERS
CRUSHES
LIZARD
ROCK
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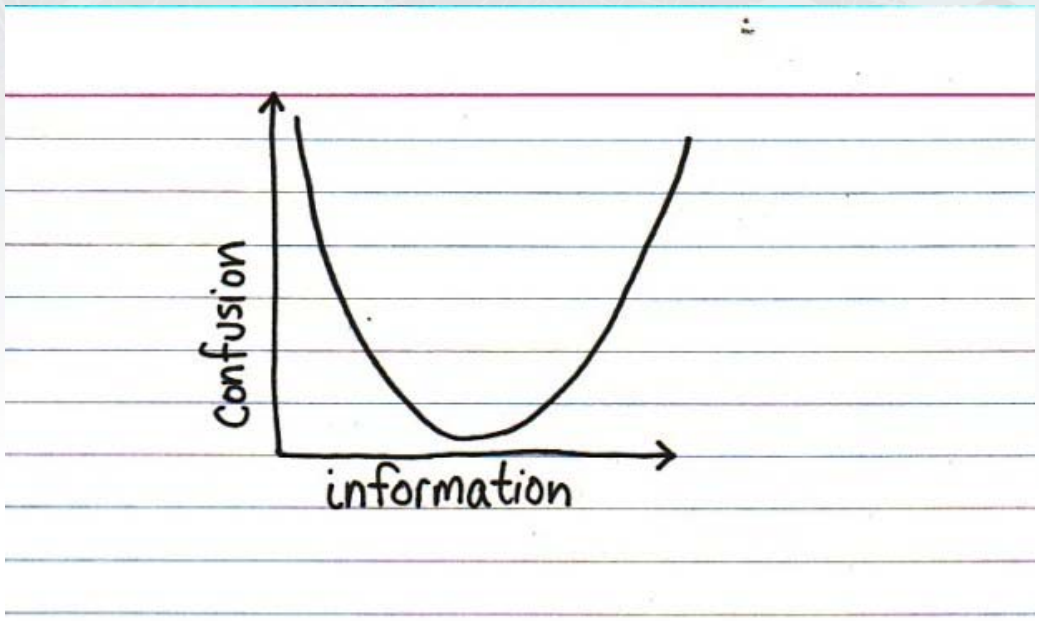
Tools You Can Use

Common Tools

- Excel
- PowerPoint
- Tableau
- Qlik
- R



Source: http://www.flowingdata.com

Closing Thoughts

What's the Focus?

- Looking for signals in the noise
- Patterns are key

Challenges to Overcome

- Policies around data ownership and use
- Legal implications
- Ethical considerations

Success in applying analytics

=

Becoming an insight-driven organization

Contact Information

Bryan Callahan, CPA/CFF, CFE, CVA
Partner
Practice Leader – Big Data & Analytics, Digital Forensics
317.383.4090
bcallahan@bkd.com
http://bkd.com/bigdata
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