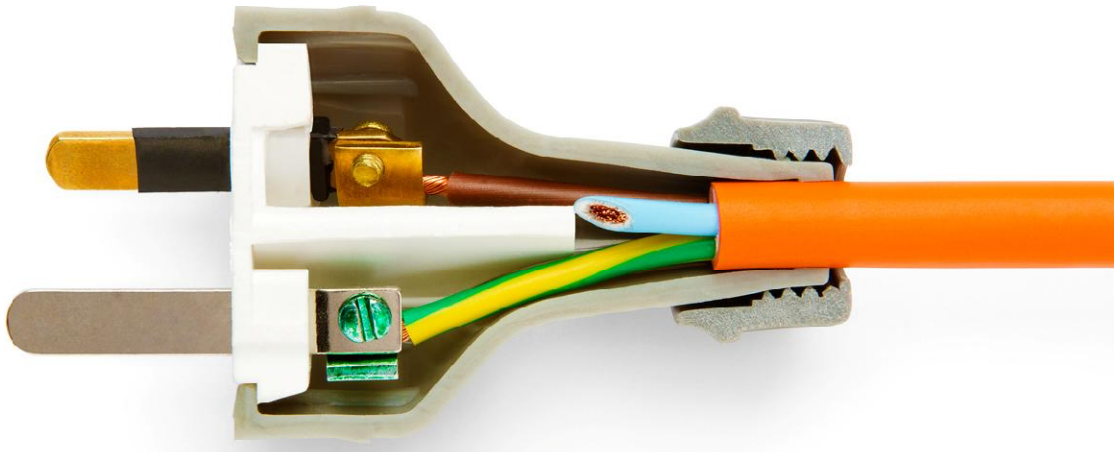
Deloitte.

Data Analytics

Julie Schoen
Deloitte & Touche



Discussion items

Background: What is Data Analytics

Analytics in the Context of Internal Audit

Sustainable Data Analytics

Visualization and Advance Analytic Techniques

Getting Started Principles of Analytics

Background: What is data analytics

Define data analytics

Analysis Methods

Analytics Applied

Example Techniques

"… [data] **analytics** is the process of obtaining an optimal or realistic decision based on existing **data**."

(Wikipedia)

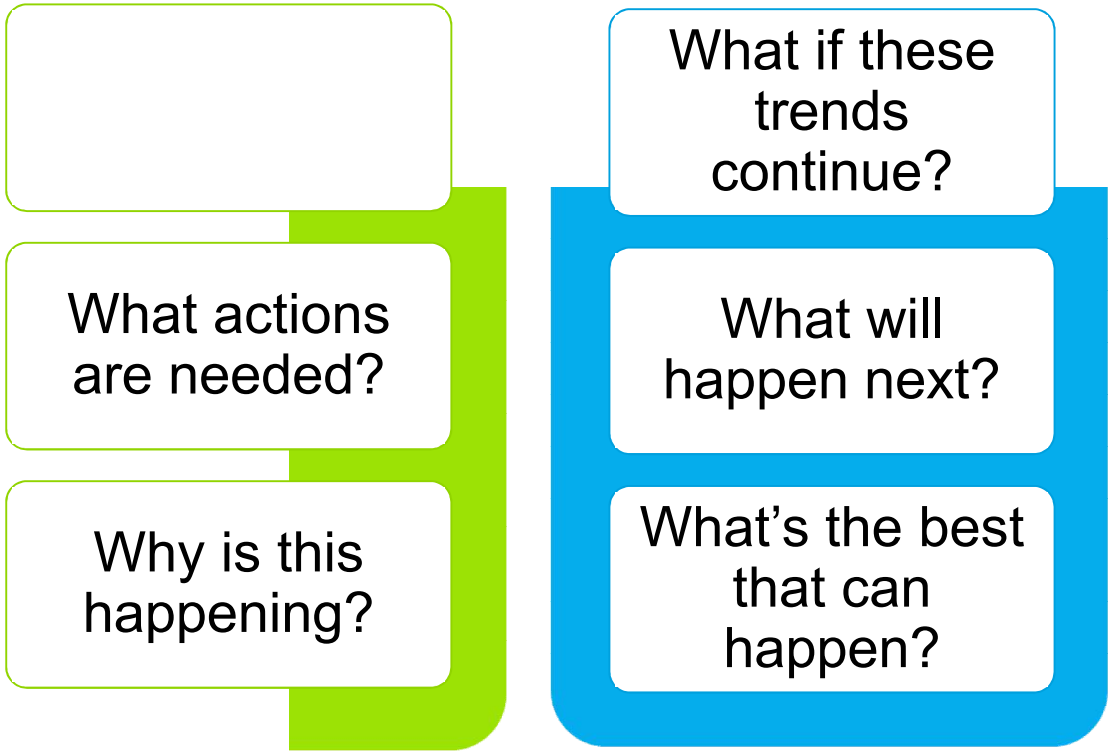
"[data analytics is]..the extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions."

(Competing on Analytics, Tom Davenport and Jeanne Harris)

"**Analytics** leverage **data** in a particular functional process (or application) to enable context-specific insight that is actionable."

(Gartner)

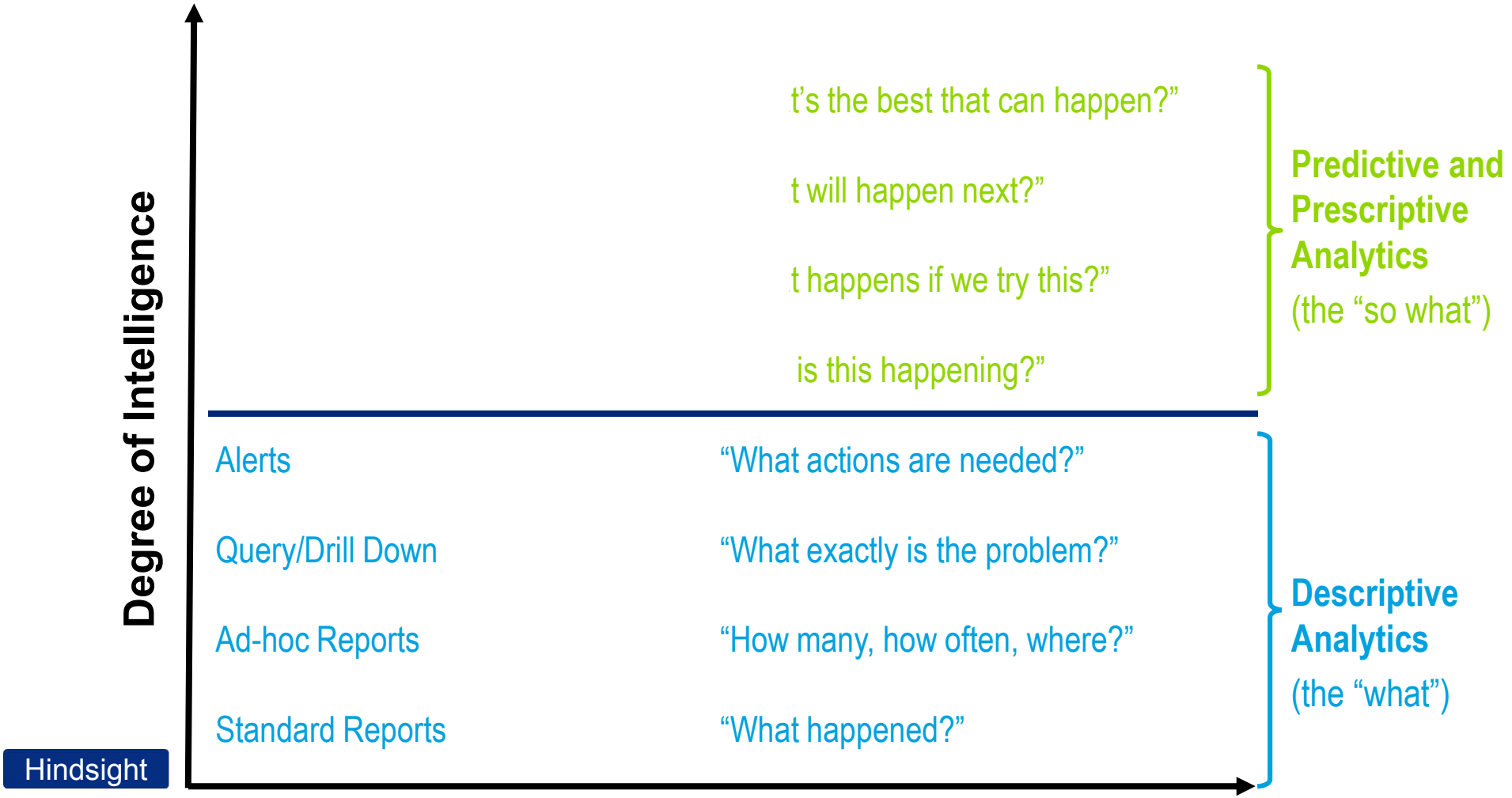
ata to produce insights or
on



- How many suspicious POS transactions were completed?
- Which stores were they in?
- What caused them?
- What could have prevented them?
- What is the magnitude of exposure?

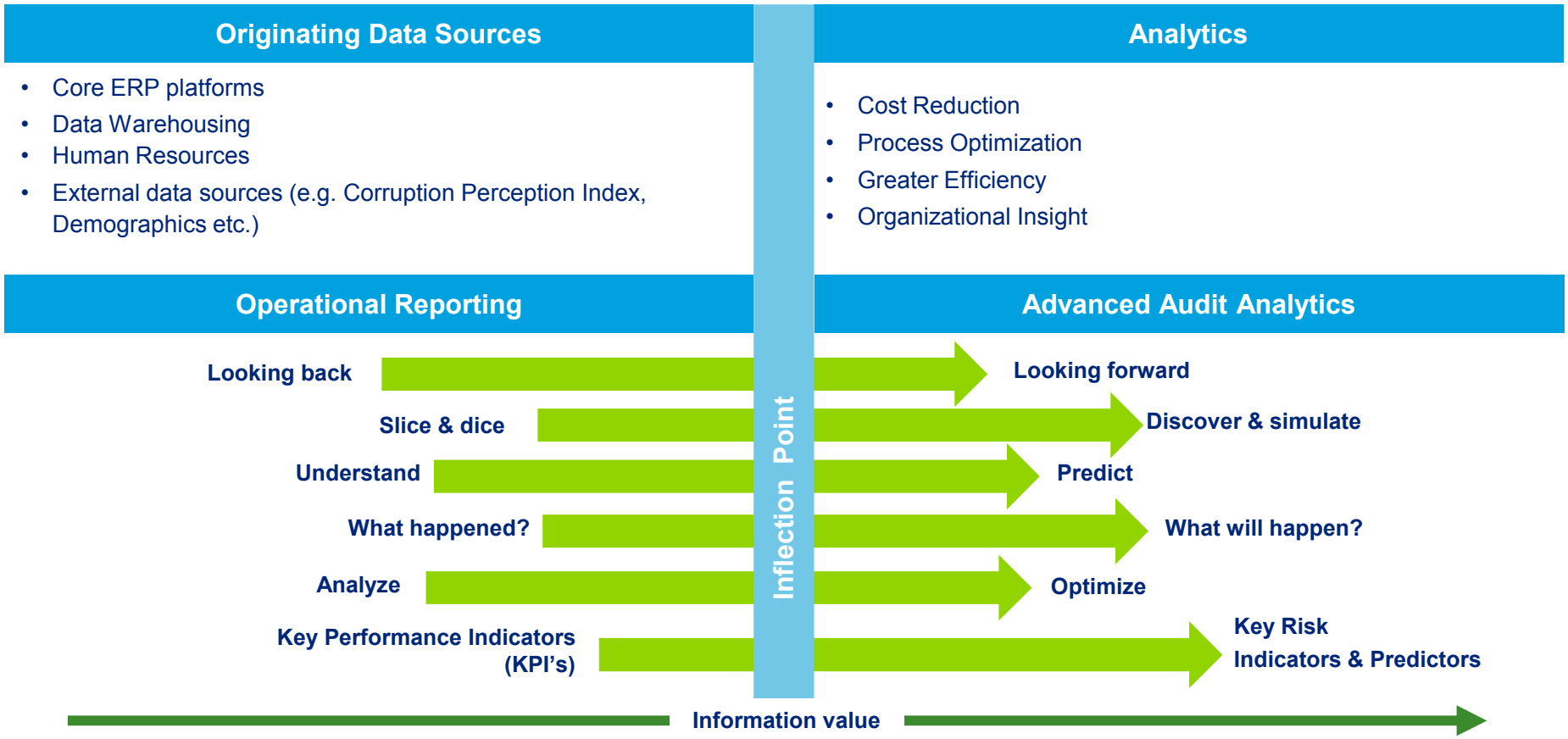
- How are our stores trending?
- Where do we continue to have problems?
- Where are controls failing?
- What is our current exposure to loss or theft?

- Where will the next spike in theft/loss occur?
- What if we increase our CCTV controls?
- What changes do we need to make to reduce the amount of theft?
- What are our optimum controls to balance the risk of loss with costs?



Smarter decisions, better results - **Tom Davenport**
October 7, 2010, Deloitte Analytics Symposium

From “What I Need to Do” to “What I Need to Know”



Internal Audit Trends

Increasing complexity

Evolving expectations

New Regulations

Unrelenting cost pressures

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- Data supports fact-based decision making
- Already used extensively in many areas of business
- Automated techniques can cover up to 100% of the audit populations
- C-level and regulator expectations of IA risk management
- Desire by auditors to do more than confirm the obvious

otential to be exploited in the
dit space

- Will boards be asking us to back up our gut feel on risk with hard data?
- Will the C-Suite want to understand the key risk factors and their relative importance in real numbers?
- Will management have even greater responsibility to foresee future risks long before they manifest themselves?
- Will data analytics be a core competency for all internal audit professionals?

ol that will be pervasive in our
sion

Industry Trends

- Powerful trends are driving the adoption of new approaches to Internal Audit

The Institute of Internal Auditors

Data analysis tools increase the efficiency of audits, make trends easier to spot, and help auditors find meaning in a mass of data. Instead of working with a limited sample of data – such as a cross section of invoices – these tools can analyze all of it, giving better audit coverage. Some respondents said their ability to use data analysis tools has enhanced their independence. It enables them to provide their own insights to management and the external auditors, for example, rather than relying on information provided to them.

IIA GAIN IT Audit Benchmarking Study 2009
Internal Auditor Magazine August 2009: *Software Trend Spotting,* Neil Baker

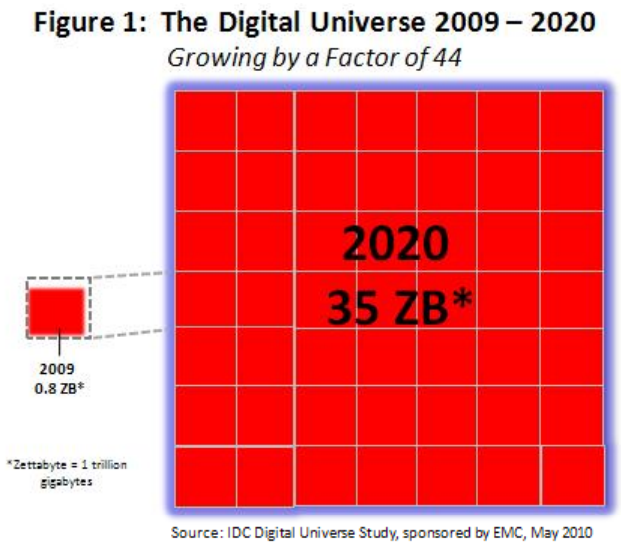
FRAUD MAGAZINE

Now, more than ever, we need to apply advanced analytics to fraud detection. Eighty percent of "enterprise data" (for example, company documents, presentations, Web, e-mail, etc.) is unstructured in nature, according to Gartner Research… An advanced fraud detection program should consider a variety of relevant sources of data. Text-based information, when analyzed rather than read, can provide valuable insight into the who, what, and when of fraud especially as it relates to the third element of the Fraud Triangle – rationalization.

Fraud Magazine May/June 2009: ***Exposing the Iceberg - Detecting Fraud by Integrating E-mail Analytics with the Fraud Triangle***, Dan Torpey, Vince Walden, and Mike Sherrod

“The Digital Universe Decade – Are You Ready?”

- Last year, despite the global recession, the Digital Universe set a record. It grew by 62% to nearly 800,000 petabytes. A petabyte is a million gigabytes. Picture a stack of DVDs reaching from the earth to the moon and back.
- This year, the Digital Universe will grow almost as fast to 1.2 million petabytes, or 1.2 zettabytes. (There’s a word we haven’t had to use until now.)
- This explosive growth means that by 2020, our Digital Universe will be 44 TIMES AS BIG as it was in 2009. Our stack of DVDs would now reach halfway to Mars.



*John Grant and David Reinsel
IDC iView May2010: “The Digital Universe Decade – Are You Ready?”

The case for change

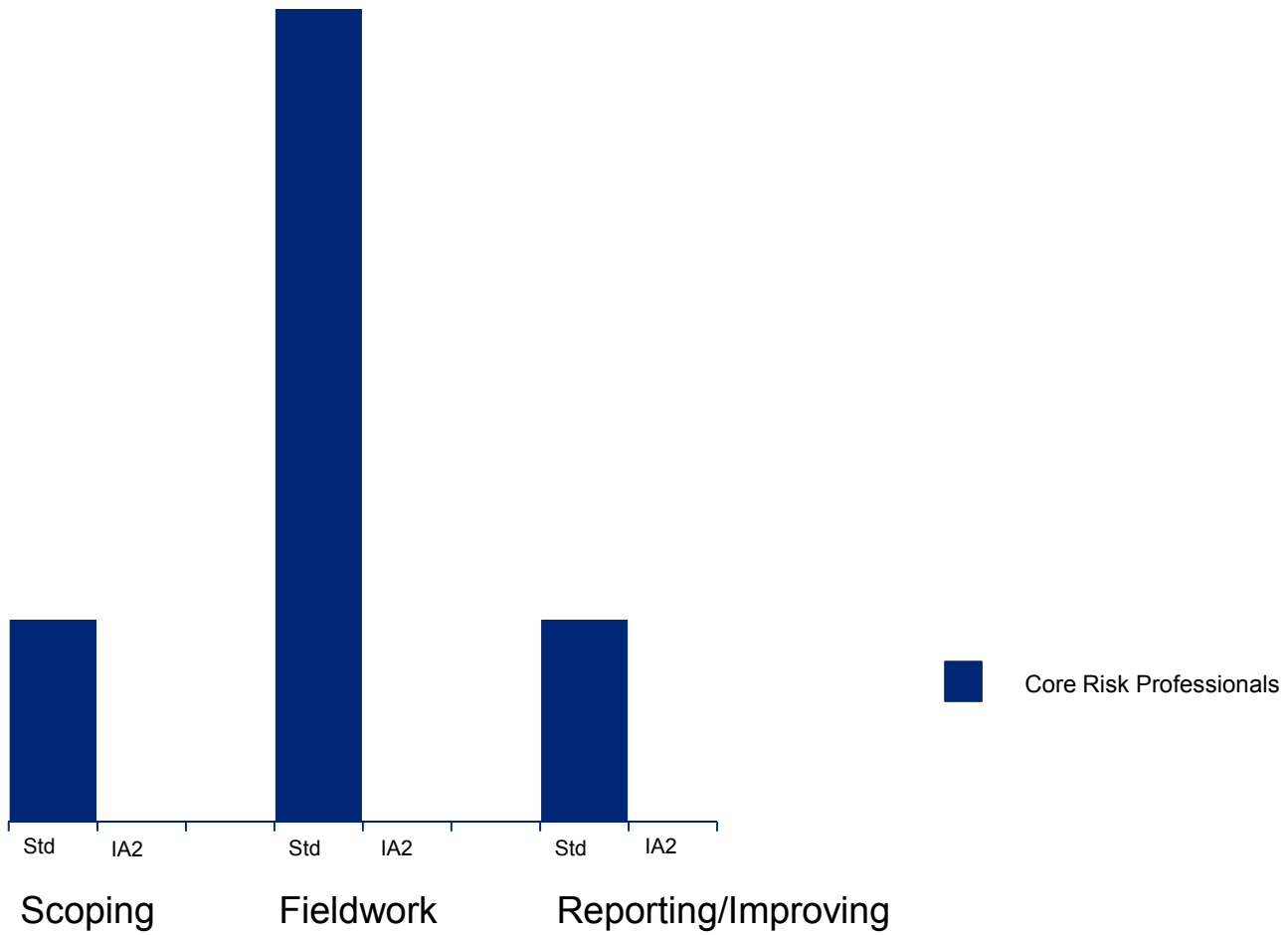
Internal audit is challenged to:

- Improve strategic relevance to the C-Suite
- Demonstrate a higher return on investment
- Not provide the obvious and avoid confirming suspicions at best
- Be insightful – see what's coming
- Cover all gaps with limited budget
- Provide fact-based recommendations

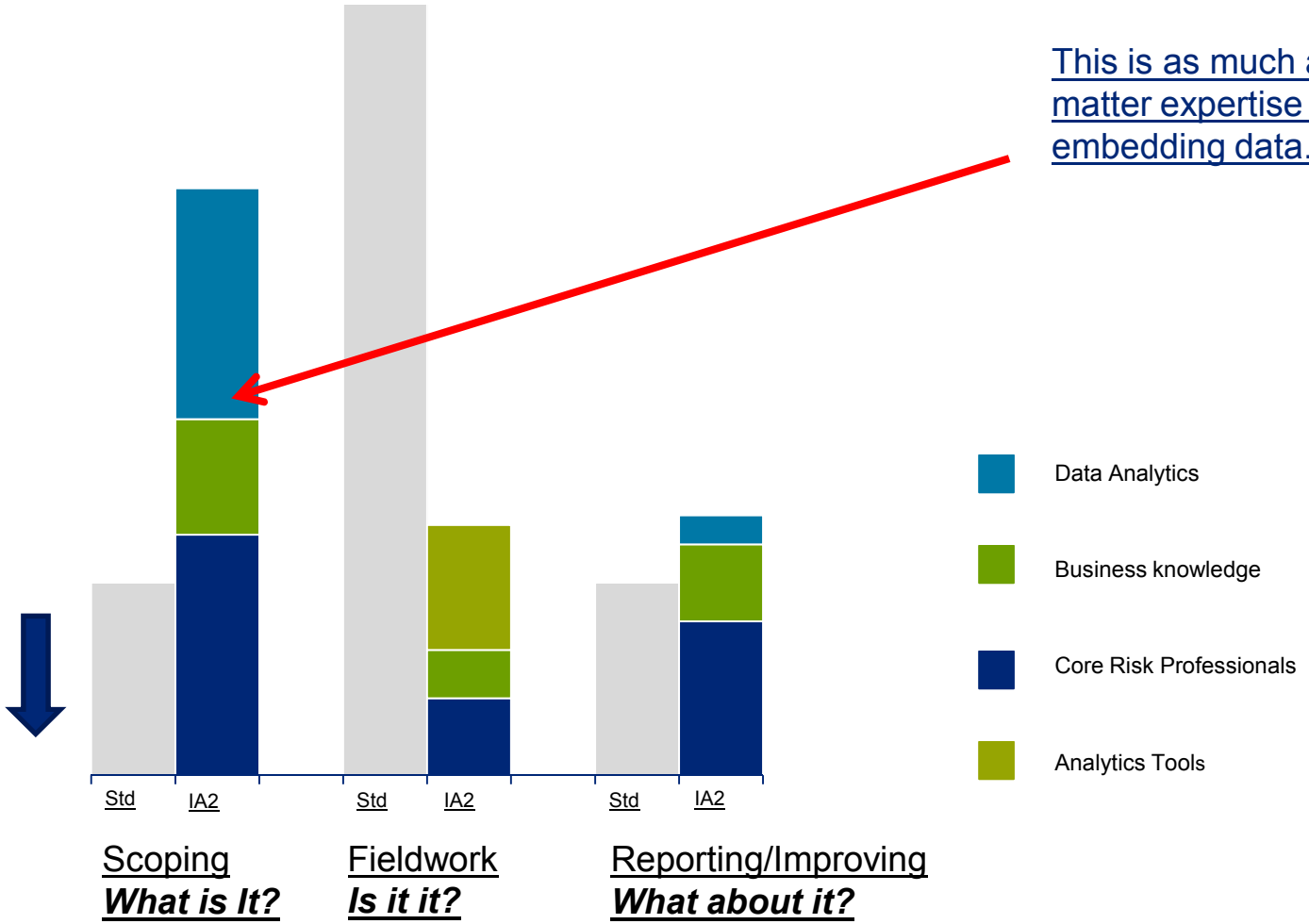
To achieve this internal audit needs to:

- Bring greater insights
- and advanced risk analysis, help build a better radar
- Challenge what it is that IA looks at
- Change resources/techniques
- Access information:
  - To provide greater intelligence
  - Quantify and benchmark
  - Drive change

A typical internal audit and its 3 stages

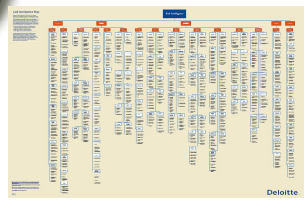


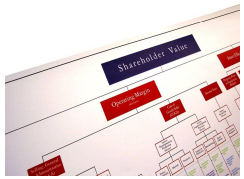
Adding new skills, tools and techniques to achieve maximum effect – speeding up the risk intelligent journey

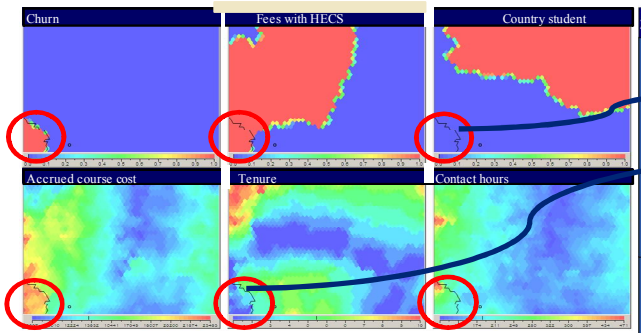


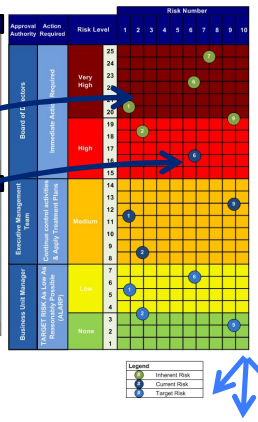
Identifying new risks through analytics and challenging existing risks

Looking inside the
What is It?









- Choose data – internal and external
- Identify new risks
- Challenge existing risks
- Utilize inductive unsupervised techniques
- Develop timely intervention strategies and better resource allocations
- Move from static to dynamic audit planning

Challenges

Challenge	People	Process	Technology	Strategy & Governance
Data acquisition	✓	✓	✓	
Reconciliations	✓	✓	✓	
Understanding of source system/data architecture	✓			
Technical skill sets	✓			
Resource availability	✓			
Design of analytics	✓	✓		
Sustainable and repeatable methodology/process	✓	✓	✓	✓
Understanding of ROI/benefits	✓			✓
Lack of long-term vision/strategy	✓	✓	✓	✓

Sustainable Analysis

Seeing and interacting with data

Seeing the analysis

Performing the Analysis

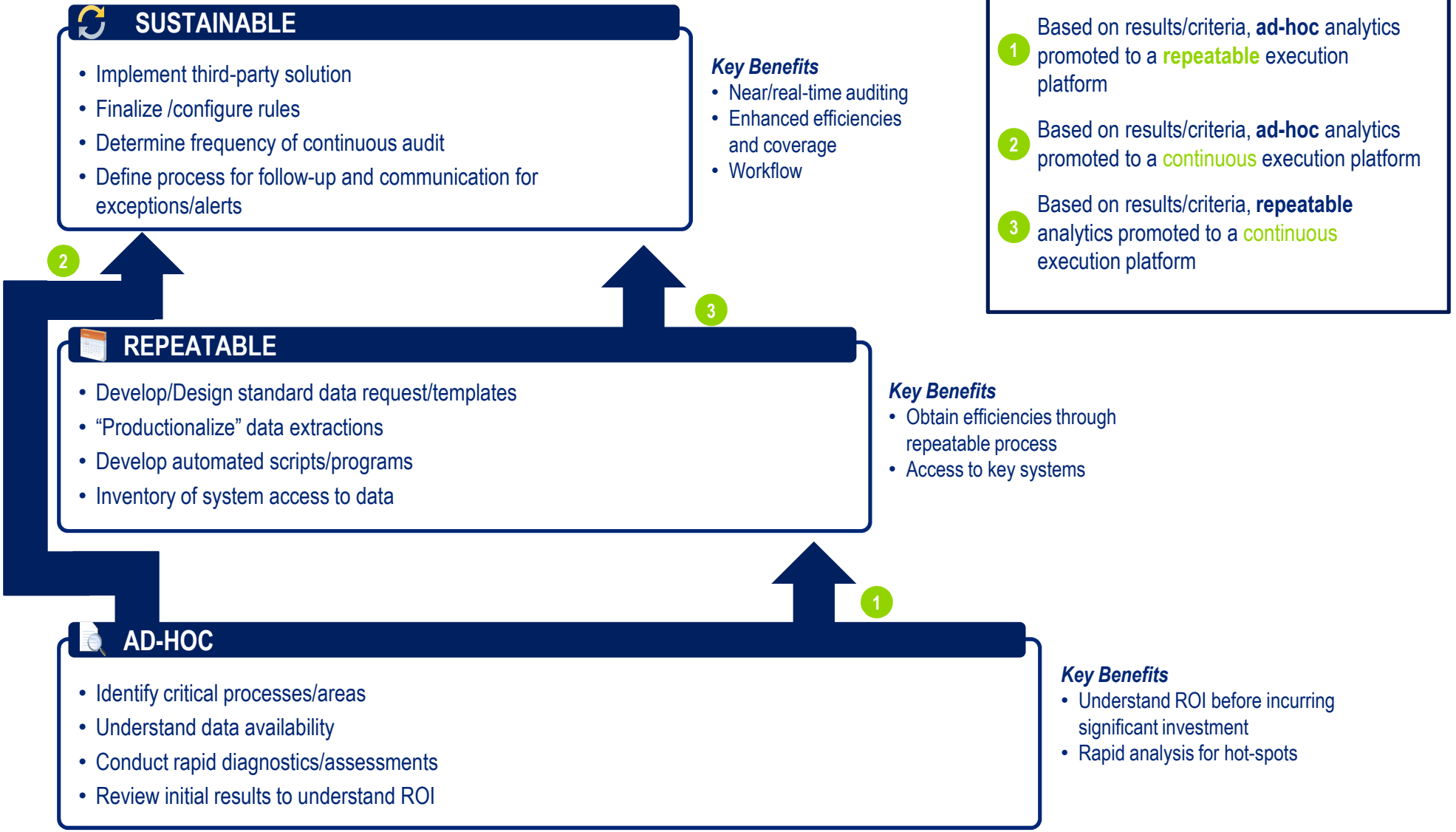
Continuous Auditing / Continuous Monitoring Defined

Continuous Auditing/Continuous Monitoring (CA/CM) is a set of people, processes and technology used to support performance management and improve financial governance in an effort to minimize loss and preserve/improve overall value.

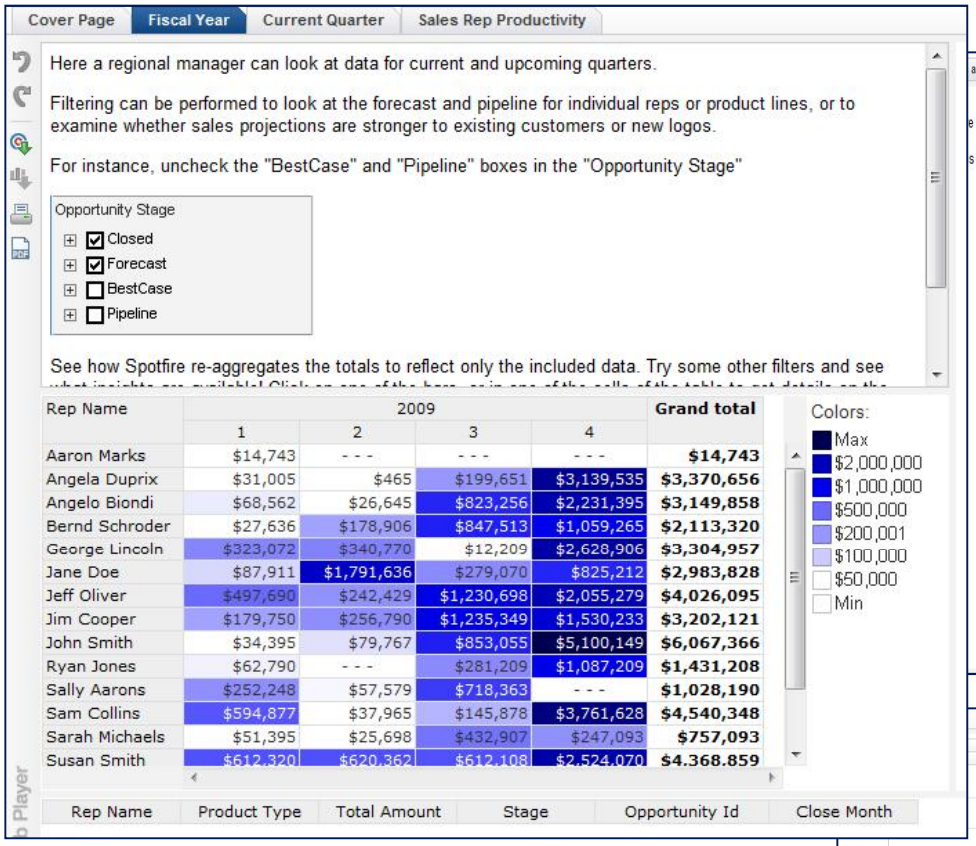
- Continuous auditing enables ***Internal Audit*** to:
  - Collect from processes, transactions and accounts data that supports auditing activities
  - Achieve more timely, less costly compliance with policies, procedures and regulations
  - Shift from cyclical or episodic reviews with limited focus to a continuous, broader review
  - Evolve from a traditional, static annual audit plan to a more dynamic plan based on the CA results
  - Reduce audit costs while increasing effectiveness through IT enabled solutions

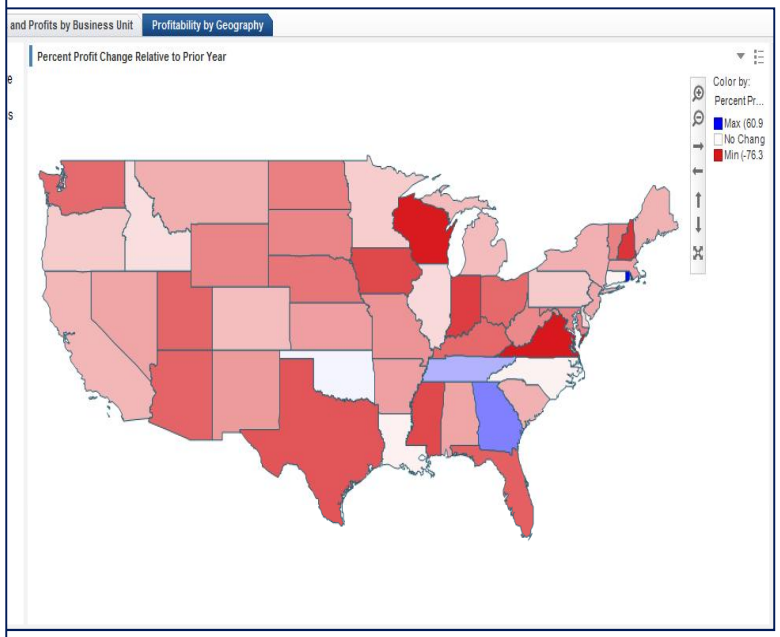
- Continuous monitoring enables ***Management*** to:
  - Assess the effectiveness of controls and detect associated risk issues
  - Improve business processes and activities while adhering to ethical and compliance standards
  - Execute more timely quantitative and qualitative risk-related decisions
  - Increase cost-effectiveness of controls and monitoring through IT enabled solutions

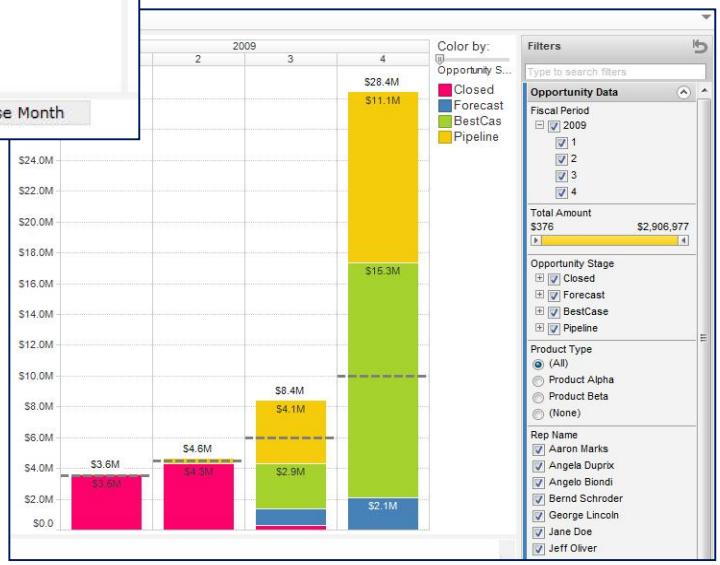
Data Analytics Promotion Path – Further Details



Dashboard over the Sustainable Analytics







Visualization & Advanced Analytics

Business increasingly needs to see its data

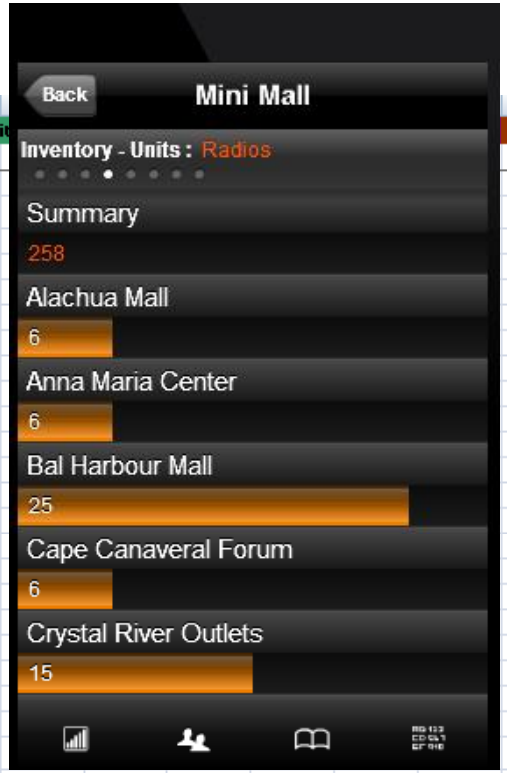
Data is the basis for decision making and the amount of data available is growing

Spreadsheets are no longer sufficient - we need color, shape, movement in space and time

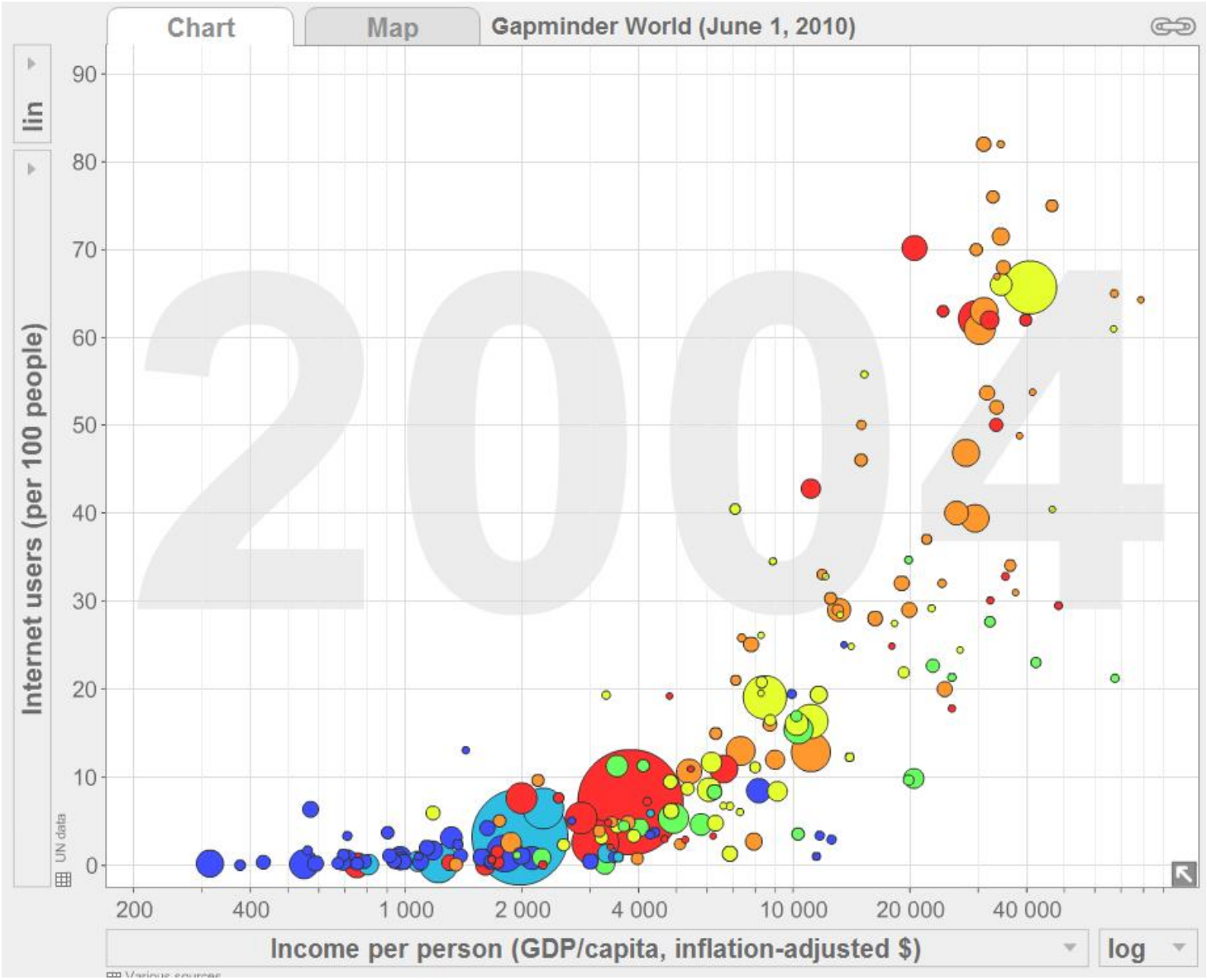
Tools and techniques have improved and put the data into the hands of the business user – The goal is to bring the analysis closer to the decision makers

Interfaces – yesterday and today

	A	B	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BH	BI
1			Radios			Laptops				Monit			Invento
2	Store Type	Store Name	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Radios	PCs
53		Winter Haven Center	$ 526	$ 1,045	$ 1,241	$ 1,361	$ 968	$ 1,041	$ 473	$ 1,216	$ 435	19	4
54	Mini Mall		$77,358	$75,040	$75,295	$77,798	######	$77,925	$77,362	$77,422	$ 77,163	258	269
55		Alachua Mall	$ 5,909	$ 5,992	$ 5,879	$ 5,475	$ 5,496	$ 5,422	$ 5,411	$ 5,694	$ 5,378	6	10
56		Anna Maria Center	$ 1,183	$ 782	$ 1,197	$ 1,445	$ 1,276	$ 1,235	$ 753	$ 1,416	$ 1,073	6	23
57		Bal Harbour Mall	$ 5,627	$ 5,750	$ 5,077	$ 5,444	$ 5,287	$ 5,327	$ 5,501	$ 5,747	$ 5,603	25	18
58		Cape Canaveral Forum	$ 1,565	$ 1,005	$ 1,308	$ 1,097	$ 1,231	$ 1,872	$ 1,208	$ 1,290	$ 1,721	6	8
59		Crystal River Outlets	$ 5,392	$ 5,090	$ 5,299	$ 5,298	$ 5,654	$ 5,823	$ 5,392	$ 5,119	$ 5,971	15	6
60		Dunedin Square	$ 5,068	$ 5,221	$ 5,097	$ 5,233	$ 5,785	$ 5,592	$ 5,858	$ 5,126	$ 5,389	7	4
61		Edgewater Outlets	$ 770	$ 426	$ 255	$ 974	$ 904	$ 867	$ 992	$ 800	$ 358	26	3
62		Gulfport Outlets	$ 5,424	$ 5,703	$ 5,200	$ 5,657	$ 5,842	$ 5,744	$ 5,875	$ 5,646	$ 5,573	23	8
63		Highland Beach Center	$ 407	$ 819	$ 506	$ 934	$ 497	$ 543	$ 501	$ 417	$ 155	5	12
64		Jacksonville Mall	$ 5,927	$ 5,744	$ 5,321	$ 5,807	$ 5,714	$ 5,467	$ 5,448	$ 5,660	$ 5,756	15	7
65		Melbourne Beach Forum	$ 5,743	$ 5,067	$ 5,974	$ 5,873	$ 5,511	$ 5,470	$ 5,641	$ 5,549	$ 5,158	11	27
66		New Port Richey Square	$ 752	$ 1,313	$ 982	$ 2,340					437	24	2
67		Niceville Mall	$ 5,612	$ 5,418	$ 5,210	$ 5,192					5,983	14	4
68		Palm Beach Square	$ 5,663	$ 5,577	$ 5,249	$ 5,967					5,562	10	24
69		Pembroke Pines Center	$ 5,641	$ 5,366	$ 5,464	$ 5,679					5,591	2	10
70		Plantation Outlets	$ 5,107	$ 5,345	$ 5,734	$ 5,805					6,018	26	23
71		Ponce Inlet Forum	$ 5,905	$ 5,126	$ 5,407	$ 5,525					5,088	7	14
72		Titusville Outlets	$ 5,519	$ 5,502	$ 5,379	$ 5,362					5,040	4	25
73		Valparaiso Center	$ 613	$ 960	$ 919	$ 989					110	9	13
74		Vero Beach Mall	$ 946	$ 153	$ 1,012	$ 643					764	17	28
75	Movie Center		$49,245	$48,856	$50,552	$48,066					3,790	343	265
76		Atlantic Beach Outlets	$ 709	$ 733	$ 733	$ 208					662	$ 176	$ 417	$ 996	$ 652	$ 380	$ 827	22	16
77		Bartow Outlets	$ 1,000	$ 1,091	$ 796	$ 943					149	$ 951	$ 1,011	$ 698	$ 848	$ 364	$ 667	27	13
78		Bradenton Square	$ 747	$ 477	$ 236	$ 147					981	$ 660	$ 548	$ 342	$ 945	$ 955	$ 289	20	13
79		Delray Beach Outlets	$ 821	$ 523	$ 619	$ 703					804	$ 1,102	$ 1,083	$ 422	$ 1,060	$ 489	$ 926	15	9
80		Edgewood Outlets	$ 793	$ 1,238	$ 1,273	$ 1,264					774	$ 1,035	$ 1,596	$ 1,001	$ 1,585	$ 1,595	$ 1,139	28	15
81		Fort Meade Outlets	$ 1,457	$ 1,303	$ 1,526	$ 1,554					1,250	$ 1,610	$ 1,396	$ 1,626	$ 1,498	$ 1,385	$ 1,163	4	22
82		Hallandale Beach Square	$ 1,607	$ 880	$ 1,449	$ 1,327					1,044	$ 1,336	$ 1,529	$ 1,827	$ 1,441	$ 1,841	$ 1,641	16	28
83		Lantana Outlets	$ 546	$ 1,186	$ 1,418	$ 1,421					770	$ 739	$ 1,481	$ 1,276	$ 876	$ 1,376	$ 1,335	23	21
84		Lauderhill Outlets	$ 2,979	$ 2,261	$ 3,004	$ 2,376					2,235	$ 2,869	$ 2,216	$ 2,583	$ 2,306	$ 2,272	$ 2,875	14	7
85		Lighthouse Point Outlets	$ 6,070	$ 5,171	$ 5,975	$ 5,804					6,036	$ 5,942	$ 5,680	$ 5,837	$ 5,228	$ 5,965	$ 5,569	29	14
86		Neptune Beach Mall	$ 5,225	$ 5,694	$ 5,379	$ 5,359					5,852	$ 5,832	$ 5,734	$ 5,088	$ 5,625	$ 5,174	$ 5,977	17	2
87		Oakland Park Outlets	$ 2,049	$ 524	$ 702	$ 354					759	$ 179	$ 220	$ 432	$ 238	$ 698	$ 26	25	23

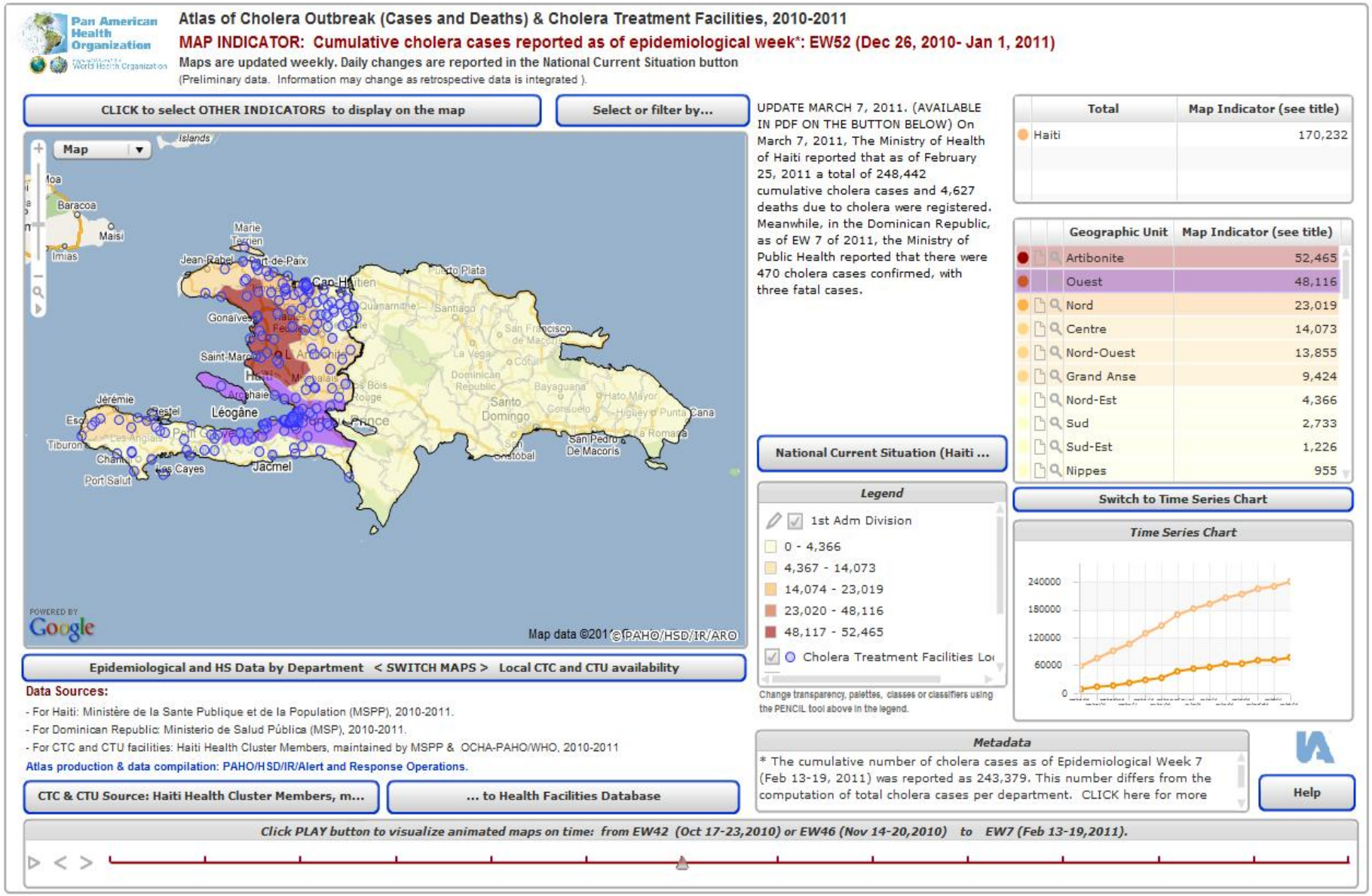


Trends over time - Internet adoption and per capita GDP by country

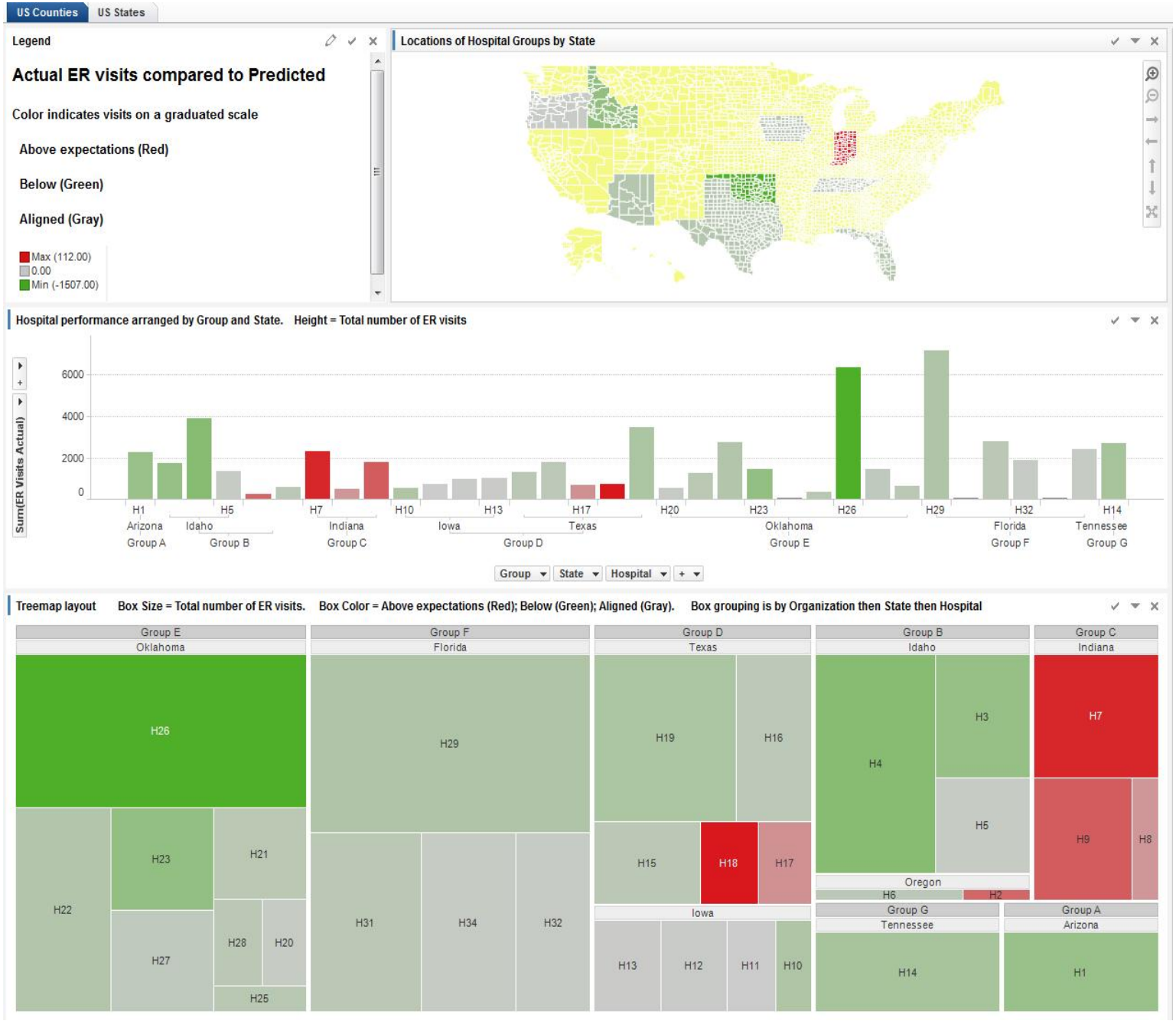


"Gapminder World" Gapminder.org. Gapminder Foundation. Web. 1 June, 2010.

Trends over space and time – tracking cholera in Haiti

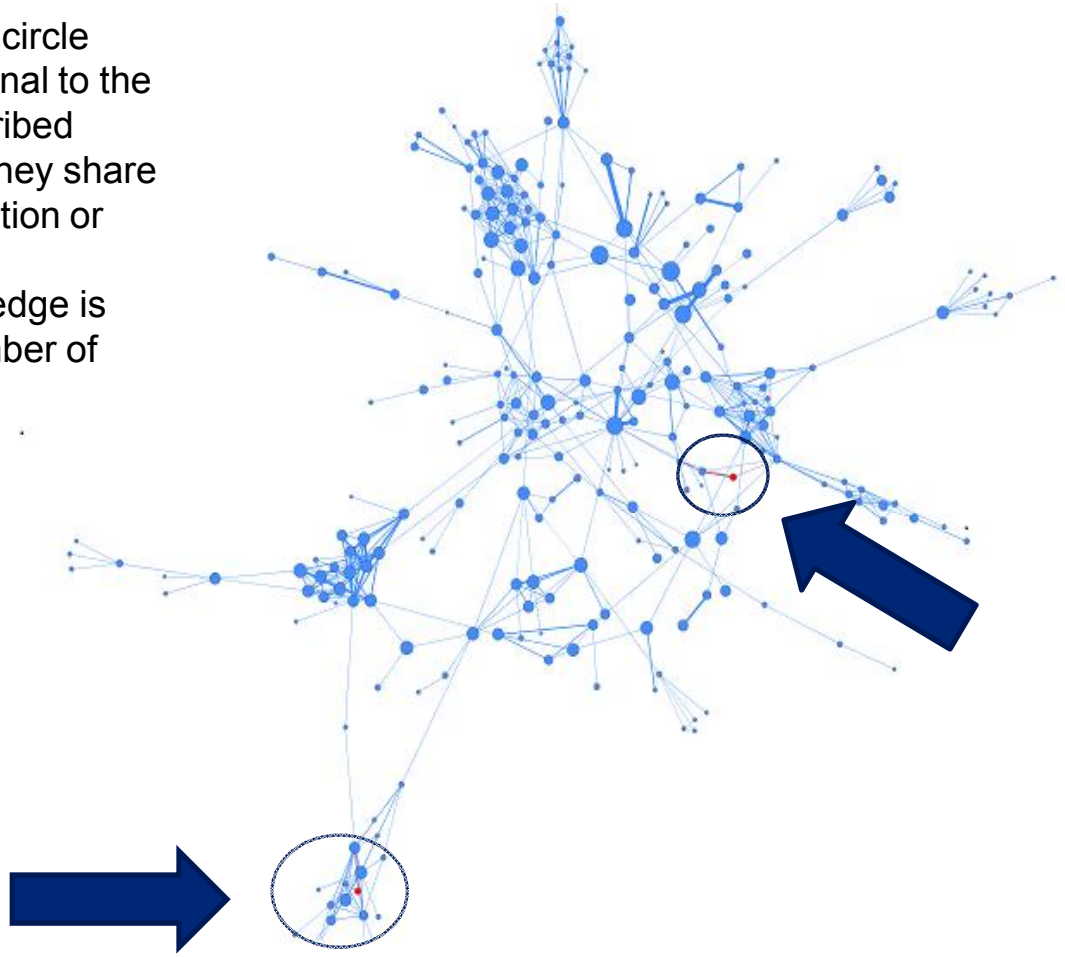


Seeing and interacting with data – hospital performance



Network Analysis – who are the influencers

- Each doctor is a blue circle whose size is proportional to the amount of drugs prescribed
- Doctors are linked if they share an organizational affiliation or have common patients
- The thickness of the edge is proportional to the number of shared patients



The two red dots are individuals thought to be key influencers
This network graph shows that others may be equally or more influential

Safety analytics diagnostic

Summary

What was the issue?

Traditional safety analytics defined scale of the safety problem, but routinely lacked insight to why those safety events occurred. A strategic safety profiling analysis could:

- Objectively identify the key factors and behaviors that impact safety related incidents and then design measurable interventions to minimize safety risk
- Use the profiling model to predict the most likely next person(s) at risk to get hurt

Approach

- Analyzed over 1000 employees over three years of employee or contractor related data sets
- Used powerful artificial intelligence techniques for making sense of high dimensional and complex data
- No assumptions made about underlying distributions or nature of inter-relationships
- All variables in all records simultaneously and objectively considered
- Model places high number of variables (dimensions) into a map where similar observations are next to each other

Typical findings

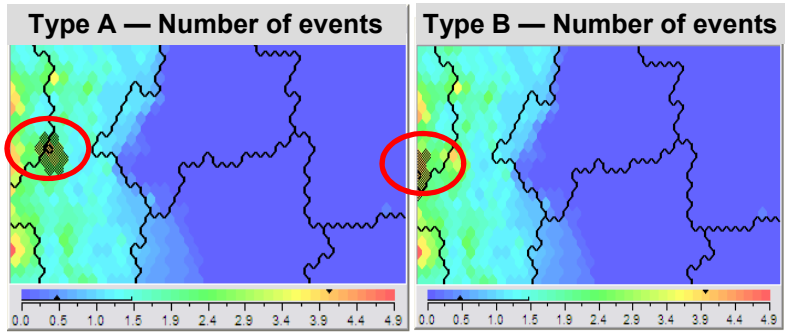
Findings are specific and not bound by traditional organizational structure reporting and identify:

- Most risky employee behaviors including specific behaviors and circumstances that produced the highest impact on safety events
- Key drivers such as rosters, equipment or team combinations that lead to down-time
- Safety training and fatigue management processes that are not working or for which employee groups the training has no marked benefit

Benefits

- One objective unified model to describe the safety landscape and assist in harmonizing the strategic safety conversations with fact based data
- Reduction of overall safety risk profile and associated disruption costs
- Actionable and targeted recommendations regarding what operational changes to consider to help minimize incidents
- Ability to track, measure and report of the effectiveness of the safety compliance program and internal efforts to minimize risk
- Immediate savings in specific refocus of fatigue management processes or training

Large Resources Company



Type A staff are almost eight times more likely to have suffered a safety event. The impact is 240% more severe than average, almost exclusively male, 20% older than average, unionized and residential at the mine site. These staff tend to get hurt in the beginning of their roster (1st or the 2nd day), generally through an object causing them harm and have not completed a required safety training unit.

Type B staff are six times more likely to have suffered a safety event with an impact almost 300% more severe than average. Their accidents are expensive tending to be sprains or soft tissue damage. In contrast to type A, these employees generally get hurt on the 7th day of a 7 day roster – just before they roll off.

Data Sources — More is Better

Employee data

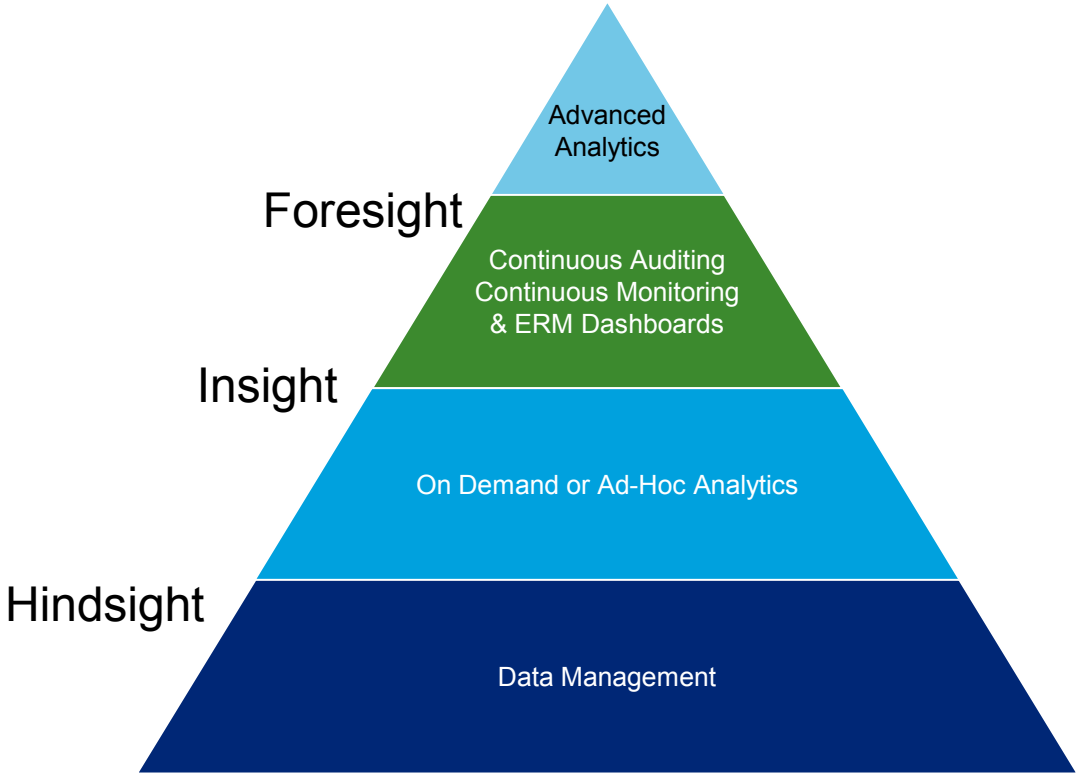
- Permanent records
- Pay slips
- Leave history
- Rosters (including FIFO)
- Training history / results
- Performance reviews
- Access card history
- Census information*

Event data

- Employees involved
- Injuries sustained / near misses / hazards
- Severity of injuries
- Equipment involved
- Location of event
- BOM Weather observations at time of event*

Technology

- Do we have the right tools to support our data analysis projects?
- Do we have an infrastructure in place that is right-sized and scalable?
- Are we effectively managing data in support of our data analysis projects?



Getting Started Principles of Analytics

Seeing and interacting with data

Seeing the analysis

Performing the Analysis

Six guiding principles - getting started with Advanced Analytics

Link Your Goals and Objectives with Clear Business Drivers	Establish a clear understanding of expected benefits from Advanced Analytics and ensure linkage to existing enterprise strategies, initiatives and competitive differentiators. This will translate into clear objectives that drive the strategy, long term vision and surface the near term opportunities.
Know Your Data	Data is the key ingredient. It drives the insights that fuel the benefits from any Advanced Analytics program. It is critical to understand both the data you have and the data you don't have when determining how and where you should begin. This knowledge also prioritizes efforts to collect what's missing for future analyses and enhancements to your Advanced Analytics program.
Start Simple	There is no need to boil the ocean at the outset. Starting with a targeted, ad hoc analytic program will yield greater benefits in terms of speed to insights, learning and value. Take the time to learn first and then deploy necessary capabilities across the enterprise later.
Leverage Existing Insights	When possible, leverage existing analytics capabilities (look within the business) to jump-start the program and build consistency with prior initiatives. These insights should also provide clues related to the risks and business areas to start with.
Make It Actionable and Measurable	Develop a plan to take action and measure results accurately early in the game. The organization, systems and process that support execution must be able to take action with the insights that are generated recommendations.
Test and Learn	Be willing to test different approaches and areas of the business. Learn from results and try new approaches based on what is learned.

Analytics – General ledger

Overview

- Procedures for analyzing general ledger data can help:
  - Identify financial statement fraud and misappropriation of assets through override of controls, errors and misclassifications
  - Increase effectiveness and efficiency of operations to maintain compliance with applicable laws and regulations

Activities

- Reconcile and perform data quality checks on general ledger population
- Identify weekend/non-business hour entries
- Isolate entries made by individuals who typically do not make entries
- Identify entries containing key words of interest
- Identify entries with round amount values or recurring ending digits
- Identify duplicate entries or entries with a large percentage variance for a particular account
- Compare the posted date and effective date of entries
- Perform Benford's analysis
- Identify unrelated, unusual or seldom-used accounts
- Identify entries made to related parties
- Identify entries made to seldom used accounts
- Identify large credits to income statement accounts

Sample Output

DA JET

Navigation | Input Parameters | P1. Integrity Checks | P2. Population Statistics | P3. Posting Period Analysis | P4. User Analysis | P5. GL Account Analysis | P6. Intercor Suspense

User Analysis

Journal Entry Type	User ID	User Name	Total Journal Entry Amount	Maximum Journal Entry Line Amount	Earliest Posting Date	Latest Posting Date	Entries Posted on Sat.	Entries Posted on Sun.	Entries Posted on Holidays
Non-Standard	User ID 02	Jane Doe	$ 162,638.51	$ 35,705.89	10/07/08	04/14/09	2	1	
Non-Standard	User ID 03	Michael Smith	$ 2,453,863.32	$ 1,033,783.78	10/10/08	04/15/09		2	
Non-Standard	User ID 04	Joe MacDonald	$ 1,146,383.39	$ 125,098.26	10/07/08	03/11/09			
Non-Standard	User ID 05	Tim Brown	$ 355,977.54	$ 57,854.00	12/02/08	04/14/09			
Non-Standard	User ID 07	Casey White	$ 3,157,716.10	$ 332,139.65	10/10/08	04/13/09	1		
Non-Standard	User ID 09	Brandon Dennis	$ 6,541.91	$ 6,541.91	12/05/08	12/05/08			
Non-Standard	User ID 13	Mike Johnson	$ 4,177.76	$ 2,050.82	01/08/09	04/08/09			
Non-Standard	User ID 14	Bob Daley	$ 513.33	$ 513.33	11/18/08	11/18/08			
Non-Standard	User ID 15	Nicole Smallwood	$ 665,742.21	$ 537,908.18	10/17/08	04/13/09	1		
Non-Standard	User ID 17	Michelle Tompkins	$ 543,303.59	$ 138,679.07	02/17/09	04/07/09			
Standard	User ID 12	sysgen	$ 572,191.34	$ 331,350.04	03/09/09	04/09/09			
Standard	User ID 24	batch4738	$ 4,071,186.60	$ 469,791.21	11/03/08	03/10/09	4		
Standard	User ID 35	daily sales trans	$ 2,737,459.92	$ 130,697.77	10/16/08	04/14/09		1	

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Navigation | Test Overview | Input Parameters | Reconciliation | Test Results | Selections

Entity Name	ABC Corp, Inc. (UK)
Date Range	10/01/08 to 03/31/09
Test Objective	Line level test that identifies journal entries that post to unrelated account combinations. Standard unrelated account combinations have been identified at the financial statement line level.
Metric	Yes or No (Unrelated Account or Not)
Test Weighting	Non-Standard: High Standard: High

Scoring Results Statistics

Non-Standard Details | Standard Details

Journal Entry Type	Exhibits Characteristic of Audit Interest?	# of Journal Entries	% of Journal Entries
Non-Standard	**Yes**	**6**	**1.18%**
Non-Standard	No	165	32.48%
Standard	**Yes**	**17**	**3.35%**
Standard	No	320	62.99%

Unrelated Account Combination

Journal Entry Type	FS Line Debited	FS Line Credited	Total Debit Amount	Total Credit Amount	# of Journal Entries
Non-Standard	BS-012 Other L-T Liabilities	IS-002 Cost of Sales	$ 4,186.56	$ 4,186.56	6
Standard	BS-006 Fixed Assets	IS-002 Cost of Sales	$ 3,468.59	$ 27.97	1
Standard	BS-010 Other Current Liabilities	IS-001 Revenues	$ 1,097,918.24	$ 1,159,391.03	16

Analytics – Revenue

Overview

- Revenue procedures can provide a comprehensive framework to identify areas of risk associated with:
  - Revenue recognition including channel stuffing, round trip transactions, fictitious sales, bill and hold, early/late cutoff, returns, etc.

Activities

- Determine an average Days Sales Outstanding (DSO) by customer
- Identify and investigate unusual increases in sales close to quarter/year end and by customer
- Determine an average unit sales price and margins by SKU
- Identify invoices and shipments without corresponding sales orders and sales without shipments
- Examine sales exceeding customer credit limits; investigate credit limit overrides
- Identify large credits to revenue at the end of the quarter and reversed at the beginning of the subsequent quarter
- Isolate the largest changes in current margin at the beginning of each quarter
- Isolate the highest margin and lowest margin
- Identify projects with a completed status but no completion date or projects with a completion date later than cut-off date

Sample Output

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Navigation | Test Overview | Input Parameters | Reconciliation | Test Results | Selections

Test 9: Large Income Statement Credits posted before Quarter End

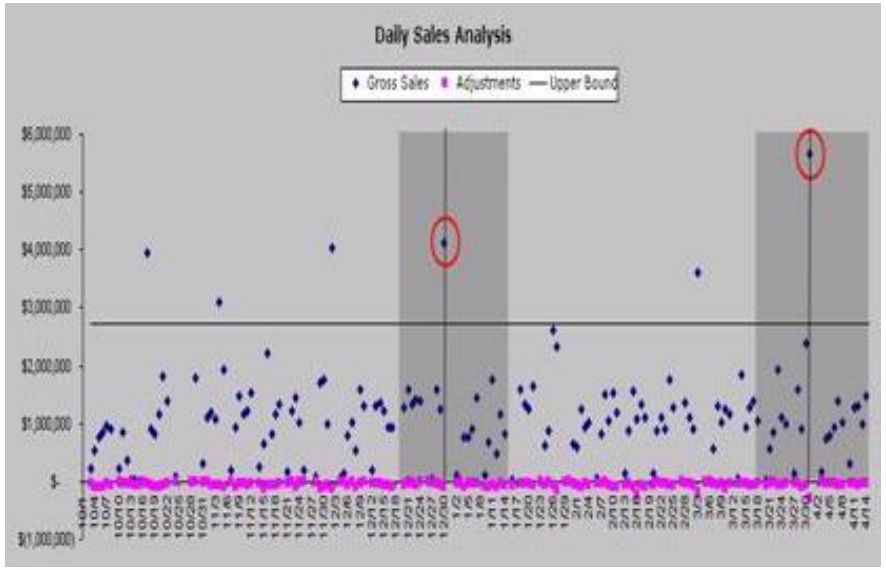
Entity Name	ABC Corp, Inc. (UK)
Date Range	10/01/08 to 03/31/09
Test Objective	Line level test that identifies large Income Statement credits made before quarter end
Metric	Income statement credits posted XXX number of days before quarter end
Test Weighting	Non-Standard: Low Standard: Low

Scoring Results Statistics — Non-Standard Details | Standard Details

Journal Entry Type	Exhibits Characteristic of Audit Interest?	# of Journal Entry Line Items	% of Journal Entry Line Items
Non-Standard	**Yes**	**1**	**0.01%**
Non-Standard	No	928	8.89%
Standard	**Yes**	**3**	**0.03%**
Standard	No	9,511	91.08%
Large Income Statement Amount Cutoff:	Non-Standard		$ 25,000.00
	Standard		$ 25,000.00
# of Days Before Quarter End:	Non-Standard		30
	Standard		30

Results Summary

Journal Entry Type	# of days before Quarter End	# of Journal Entry Lines	Total Amount
Non-Standard	0	0	$ 0.00
Non-Standard	1	0	$ 0.00



Analytics – Travel & entertainment expense

Overview

- Procedures for analyzing travel and entertainment expenses can provide insights to better understand fraud, waste or process breaches as a result of overpayments or unauthorized transactions

Activities

- Identify employees with number of expense claims per day greater than the acceptable maximum number of claims by expense type by amount or count
- Identify claims where transaction amount was above or below a threshold of the transaction limit
- Identify transactions where the employee who created the expense claim is the same employee who approved the expense claim
- Identify duplicate transaction amounts to the same vendor from the same employee
- Identify duplicate transaction amounts to the same vendor, charged on the same date claimed by two different employees
- Identify transactions from the same employee who has claimed for both gas and mileage expense
- Identify transactions where the cardholder name does not exist or has a terminated status in the HR file
- Identify transactions where the cardholder last name is included in the merchant name

Sample Output

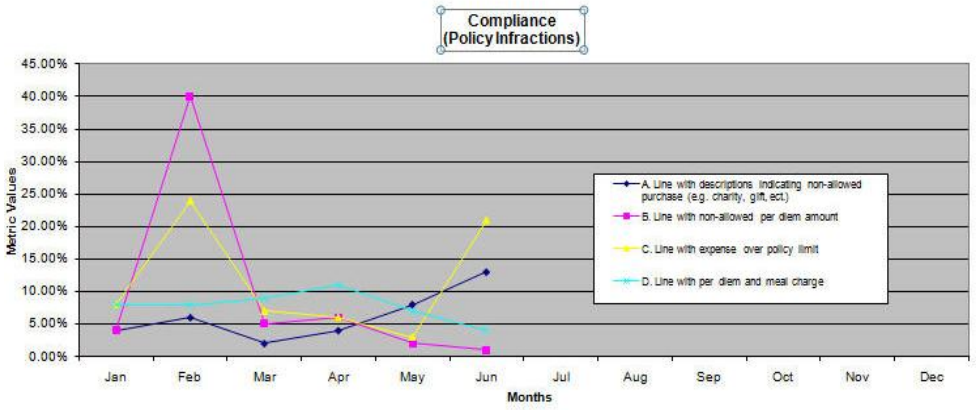
Pillar 1: Operating Margin/Data Quality	Metric Weight:	Monthly Scores Jan	Feb	Mar	Apr	May	Jun
A. Line with zero or blank amount	20%	1	1	3	3	3	1
B. Line with invalid employee name / ID	30%	3	5	3	5	5	5
C. 2 or more lines with all duplicate information	30%	3	3	3	3	3	3
D. 2 or more lines with duplicate employee, amount, trip dates	20%	1	1	3	5	1	1

Pillar 2: Operating Margin/Anomalies	Metric Weight:	Jan	Feb	Mar	Apr	May	Jun
A. Employee with fewer than 5 claims	15%	1	1	1	1	1	1
B. Employee submitted more than 2 claims on same day	25%	1	1	1	1	1	1
C. Approver of fewer than 50 claims	15%	1	1	5	1	1	5
D. Approver of 1 or more claim with approver date before submit date	25%	1	1	3	3	3	1
E. Line with description containing specific defined words (e.g. Personal, Family, ect.)	10%	3	1	3	1	1	3
F. Line with total round value amount (e.g. 000)	10%	1	3	1	3	1	1

Pillar 3: Cost Reduction (Opportunities for refined policy)	Metric Weight:	Jan	Feb	Mar	Apr	May	Jun
A. Claim with trip dates over holiday &/or weekend days	15%	3	1	3	1	5	5
B. Line with service date on holiday &/or weekend days	15%	1	1	1	3	5	5
C. Employee with more than 100 claims in period	15%	1	1	3	1	3	3
D. Employee with more than $200,000 total claims in period	15%	1	1	1	3	5	3
E. Employee with claim exceeding $10,000	10%	1	1	1	5	5	1
F. Employee with line exceeding $3,000	15%	1	1	1	5	3	3
G. Approver with more than $2,000,000 total claims	15%	1	1	1	1	5	1

Pillar 4: Governance (Opportunites for enhanced governance)	Metric Weight:	Jan	Feb	Mar	Apr	May	Jun
A. Line with all blank description(s)	15%	5	5	5	5	3	3
B. Line with 1 or more blank date (submit, trip, line)	10%	5	3	5	5	5	3
C. Line with description(s) < 4 characters	10%	5	5	3	5	5	3
D. Claim approved by employee submitting or no approver	20%	5	5	5	5	5	5
E. Claim submitted > 45 days before trip/service date	15%	5	5	5	3	3	5
F. Claim submitted > 30 days after trip/service date	10%	3	5	5	5	5	5
G. Approver of more than 5000 claims	10%	5	3	3	3	3	3
H. Approver approved more than 30 claims on same day	10%	3	3	5	3	5	5

Pillar 5: Compliance (Policy infractions)	Metric Weight:	Jan	Feb	Mar	Apr	May	Jun
A. Line with descriptions indicating non-allowed purchase (e.g. charity, gift, ect.)	20%	5	5	3	5	5	5
B. Line with non-allowed per diem amount	25%	5	5	5	5	5	3
C. Line with expense over policy limit	30%	5	5	5	5	5	5
D. Line with per diem and meal charge	25%	5	5	5	5	5	5



Analytics – Accounts payable

Overview

- Procedures for analyzing accounts payable can provide insights to better understand:
  - Payments made to unauthorized or restricted vendors or inappropriate payments made to authorized vendors
  - Operational inefficiencies in the procure to pay process from requisition to payment

Activities

- Perform vendor master analysis:
  - Duplicate vendors
  - Obsolete vendors
  - Vendors similar to employees
  - Vendor trending by period
- Perform invoice analysis:
  - Duplicate invoices
  - Payment date vs. invoice due date
  - Requisition / purchase order date vs. invoice date
- Perform disbursement analysis:
  - Total payments to unauthorized / restricted vendors
  - Duplicates / gaps on check and invoice numbers
  - Identification of payments processed by user who updated vendor master record
  - Payments posted on weekends / holidays

Sample Output

Total Active Vendor Population:

Status	US
Active	8,784

Potential Duplicate Vendors (similar matches):

Duplicate Method	US	% Total US Active
Similar Vendor Address*	293	3.3% of total US active
Similar Vendor Name*	62	0.7% of total US active
Similar Empl/Vend Add.	194	2.2% of total US active

** Includes potential duplicates from exact match method on previous slide.*

Sample Results:

VENDOR	NAME	STATUS	ADDRESS_1	CITY	ST	POSTAL
0000003165	UNIVERSAL REFRIGERATION	A	4176 JACOB HIGHWAY	PASADENA	MD	21122
0000004758	UNIVERSAL AIR CONDITIONING & HEATING	A	4176 JACOB HWY	PASADENA	CA	21122

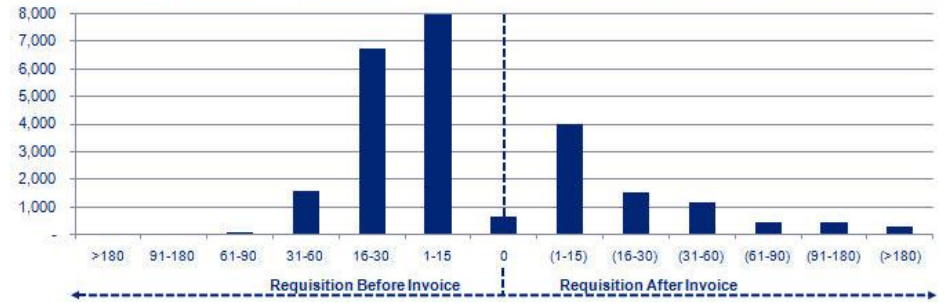
VENDOR	NAME	STATUS	ADDRESS_1	CITY	ST	POSTAL
0000001838	JOHN SANTANA AND SONS, INC.	A	2900 E. BAYSTREET	PHILADELPHIA	PA	19137
0000005615	JOHN SANTANA & SONS	A	2900 EAST BAYST	PHILADELPHIA	PA	19137

VENDOR	STATUS	CLASS	NAME	ADDRESS_1	POSTAL
0000004110	A	R	RAY LEWIS	111 PYKE RD. NW	30305

EMP_ID	STATUS	TERMDT	NAME	STREET_LINE_1	ZIP	TITLE
1358	TERM	10/24/07	Johnathan Harris	125 PYKE VALLEY RD.	30305	*Specialist I, Customer Care

Aging	Req Line Count	Req Amount	Inv Amount
>180	22	276,566	276,566
91-180	46	834,515	835,967
61-90	76	501,304	501,302
31-60	1,590	2,221,451	2,221,657
16-30	6,734	2,495,594	2,495,461
1-15	7,973	11,140,562	11,139,364
0	646	932,013	932,047

Aging	Req Line Count	Req Amount	Inv Amount
(1-15)	3,991	9,054,765	9,041,479
(16-30)	1,519	4,163,906	4,162,954
(31-60)	1,160	10,742,492	10,738,572
(61-90)	440	8,393,834	8,393,834
(91-180)	453	3,114,739	3,110,219
(>180)	293	696,070	694,106
Total	**24,943**	**54,567,811**	**54,543,530**



Analytics – Other key processes

Inventory

- Missing key data/fields, e.g. part number, quantify, cost, etc.
- Duplicates, e.g. duplicate descriptions, item numbers, prices, etc.
- Negatives, e.g. negative quantities, cost per unit,
- Items on hand with a zero unit cost
- Identify characteristics of interest including high dollar or quantify items, unusually low quantities, unusual fluctuations around period ends, etc. through summarization and stratification
- Value-added data analysis to mitigate fraud, revenue leakage or operational inefficiencies associated with variations in prices/costs, budget allocation and price performance

Purchase Cards

- Cardholders with a spending limit of the maximum amount that have an actual purchase amount of significantly less
- Summary of transactions per approver
- Purchases made by groups of Merchant Category Codes
- Summarization of purchases by vendor by period
- Spend analysis per card holders to identify unusual activity
- Potential duplicate or split transactions
- Repetitive buying pattern of even dollars, near purchase limits, or same or similar name for vendor
- Fewer than five cardholders using a specific vendor
- Purchases from non-standard vendors

Payroll

- Compare and summarize costs for special pay or overtime
- Compare time-card rates and pay to payroll
- Payroll checks where the gross dollar amount exceeds a predetermined “excessive” threshold
- Changes in exemptions, gross pay, hourly rates, etc.
- Transactions for deceased employees (per Social Security Administration) or terminated employees who are still receiving pay
- Employee Net Pay is equal to Gross Pay (i.e., no deductions)
- Payment transactions where the payment was created and approved by the same individual
- Employees with a suspicious address or bank account

Accounts Receivable

- Identify all shipping documents where the shipping price differs from the sales order price
- Identify all transactions where the sales order was entered after the invoice
- Identify all sales orders where the discount amount is in excess of a certain percentage of the list price
- Generate invoice summaries by customer, invoice, amounts, etc.
- Identify duplicate invoices, credits, or receipts in any order
- Identify high value credit notes, balances and invoices
- Report and age total receivables
- Report gaps in the sequence of invoices generated

Foreign Corrupt Practices Act (FCPA) Analytics

- Analysis of high-risk general ledger accounts
- Review of expense reports of high-risk employees
- Petty cash activity and cash advances
- Significant write-offs of Accounts Receivable
- Evaluation of tax, environmental or other disputes with governmental agencies

How to Identify Red Flags

- FCPA Analytics anomaly tests can detect:
  - One-time payments to vendors (vendor often not officially set up and cleared through AP)
  - Large round-dollar payments (surprising how common)
  - Sequential or same invoice numbers from same vendor (only customer, fictitious vendor)
  - Duplicate invoice paid twice (common way to facilitate an extra payment)
  - Payments to countries where company does no business
  - Payments made to vendors with same bank account as employee
  - Payments to politically exposed persons
  - Payments made to invalid addresses or P.O. boxes
  - Invalid business addresses or phone number

Start From Where You Are

An honest self-assessment is the first step in understanding your current capabilities – and the gaps you'll need to close to get more value from your analytics investments. Think in terms of both technical capabilities and organizational depth.

Grade yourself

There are lots of different maturity models to assess your starting position – use as many of them as you can. It's the smart way to get a clear view of the gaps you'll need to close.

Prioritize projects

Focus early investments on projects with a high probability of producing business value.

Fill the cracks

Even smart projects in isolation may not cover all the capabilities needed. But if you augment them with investments that span silos – such as enterprise data management, information delivery, and visualization tools, you'll quickly build the necessary foundation getting even more value from discrete projects.

Analytics Roadmap and Data Governance Model

Multi-Year Roadmap

- Building a two to three year roadmap that details the way in which your analytics program will be implemented over time will help stakeholders understand and realize the benefits and objectives. Everyone will share the same vision and have "bought in" – Internal Audit, IT, business owners and senior leadership.
- The road map should be designed to evolve and will require regular updates and maintenance throughout the multiyear delivery program.

Governance

- Establishing a program governance model is critical to the success of most large, complex initiatives that span across an organization/years.
- The governance structure will determine the escalation path for projects that have significant risks and have the authority to scope and de-scope each project.

Closing thoughts

Data analytics requires innovative thinking about sourcing data and identifying risks

Data analytics is as much, if not more, about asking the right questions as it is about the mathematical contortions going on behind the scenes

Data analytics can be applied to more aspects of Internal Audit than simply continuous monitoring and look back audits

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