NTAC:4UC-11

DATA ANALYTICS AND DATA VISUALIZATION – THE FUTURE OF INTERNAL AUDIT

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AGENDA

1. What is Data Analytics and Data Visualization
2. Big Data and Medium Data
3. IA Robotics, Machine Learning and the Future
4. Data Analytics and the Internal Audit Function
5. IIA Research and Data Analytics Book
6. Actual Examples

WHAT IS DATA ANALYTICS AND DATA VISUALIZATION

Key Definitions

Data analytics is the process whereby multiple datasets (both internal and external) are identified, consolidated and quality checked and put into a format where analysis can be done with the goal of identifying useful information that better supports corporate decision making.

Data visualization is the process to help the end-user better understand the significance of the data pool by allowing the review of the data in a visual context. Data visualization will allow end-users to identify key patterns, trends and correlations within the data that might go undetected in a text-based columnar report format.

WHAT IS DATA ANALYTICS AND DATA VISUALIZATION

Key Definitions – Benford's Analysis

$0.00	$2.07	$2.00	$1.50	$0.00	$0.90	8.97	5720.79	6.47	16.52	14.21	30.73	33.69	$1,010.80
$2.50	$3.77	$2.50	$1.00	$1.40	$0.00	15.17	5735.96	11.2	17.00	14.02	31.02	32.55	$976.43
$1.50	$9.07	$3.50	$0.00	$0.70	$0.30	33.07	5768.73	15.1	17.65	14.09	31.74	33.15	$994.37
$9.00	$10.47	$0.50	$1.50	$1.40	$0.00	46.87	5815.60	22.9	18.14	14.38	32.52	34.08	$1,022.43
$2.50	$4.44	$2.00	$1.50	$3.15	$0.00	33.84	5849.44	13.6	17.49	14.39	31.88	33.58	$1,007.52
$5.50	$13.72	$1.50	$0.50	$4.20	$0.90	44.57	5893.11	26.3	17.76	14.34	32.10	33.45	$1,003.55
$2.00	$4.72	$2.50	$0.00	$1.05	$0.00	37.27	5930.38	10.3	16.40	15.13	31.52	33.09	$992.62
$2.00	$1.56	$0.00	$0.00	$0.35	$0.60	10.51	5940.29	4.51	16.16	15.23	31.39	31.51	$945.38
$1.00	$4.00	$0.00	$1.00	$1.05	$0.00	14.05	5954.34	7.05	16.08	15.27	31.35	29.91	$897.27
$3.50	$13.42	$7.50	$0.50	$0.70	$0.30	48.07	6002.11	25.9	16.85	15.71	32.56	31.06	$931.67
$8.00	$8.23	$4.00	$2.50	$1.05	$0.00	42.68	6044.79	23.8	17.44	15.65	33.09	32.04	$961.09
$4.00	$7.90	$2.00	$1.25	$4.20	$0.30	43.95	6088.44	19.7	17.12	16.17	33.28	32.28	$968.37
$3.00	$6.78	$2.50	$2.50	$1.05	$0.00	44.63	6133.07	15.8	16.78	16.94	33.72	32.34	$970.29
$2.00	$6.20	$1.50	$1.50	$0.70	$0.00	36.50	6169.57	11.9	15.31	17.55	32.87	31.79	$953.70
$1.00	$1.26	$0.00	$0.25	$0.35	$0.00	10.96	6180.53	2.86	15.06	17.95	33.01	30.95	$928.44
$0.00	$3.83	$1.50	$2.00	$1.40	$0.90	18.63	6198.26	9.63	14.95	18.31	33.26	30.91	$927.25
$8.50	$9.74	$3.00	$0.00	$1.40	$0.00	42.44	6240.70	22.6	15.49	18.44	33.93	31.78	$953.46
$3.50	$9.17	$2.00	$1.50	$1.40	$1.20	41.87	6281.37	18.8	15.19	18.38	33.57	32.81	$984.22
$3.00	$9.73	$5.50	$0.50	$5.25	$0.00	49.78	6331.15	24	15.94	18.77	34.71	33.70	$1,011.02
$4.00	$11.00	$3.00	$2.00	$21.00	$0.00	72.20	6403.35	41	16.99	19.70	36.68	34.91	$1,047.20
$1.00	$7.12	$1.00	$1.50	$3.50	$0.00	40.52	6443.87	14.1	17.26	19.65	36.91	34.83	$1,044.93

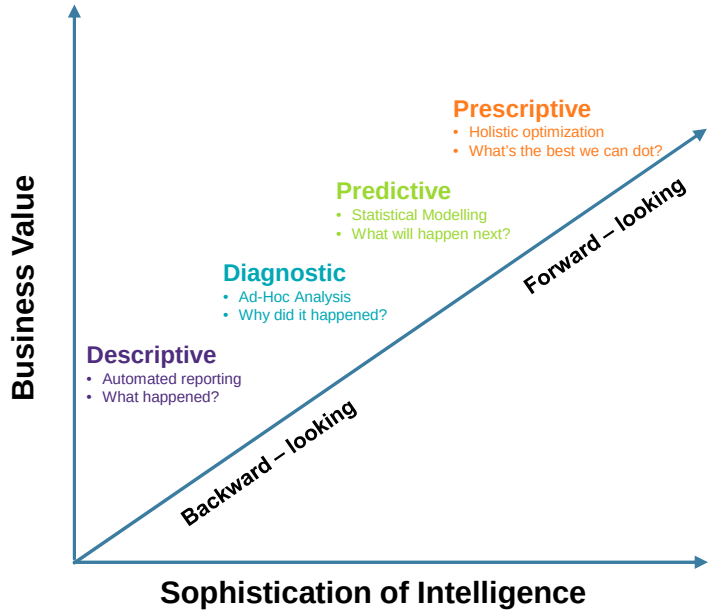
WHAT IS DATA ANALYTICS AND DATA VISUALIZATION

Key Definitions

Analytics definition

Making data timely and actionable

- Data is **historical**
- Decisions are about the **future**
- Leverage knowledge and technology to **bridge the gap**



BIG DATA AND MEDIUM DATA

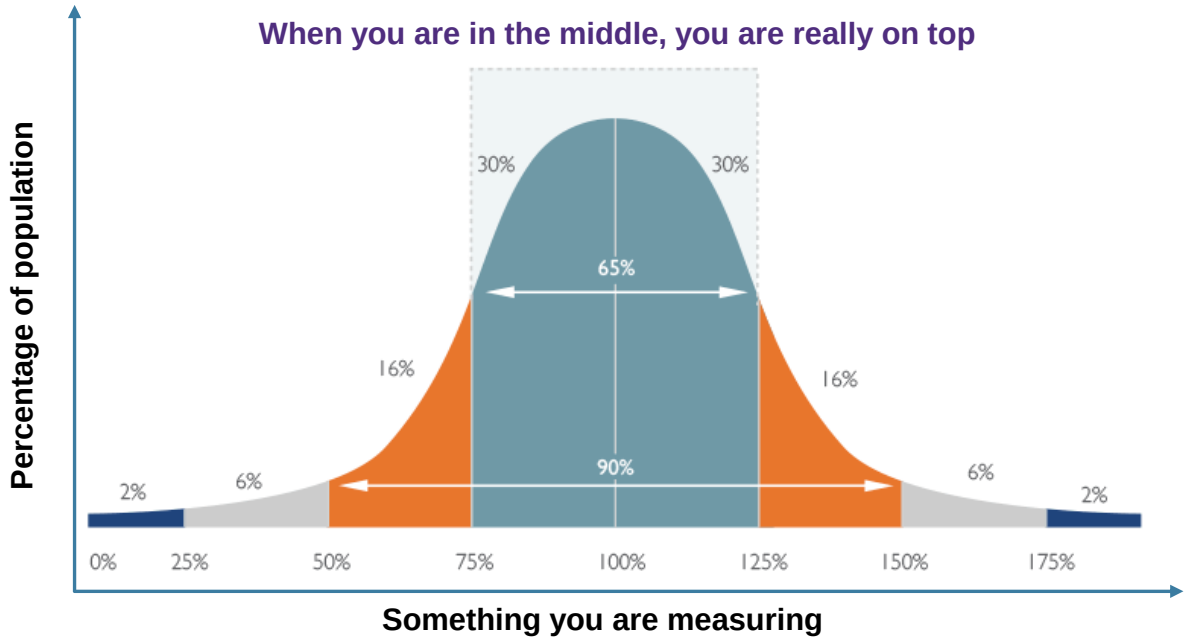
What is the difference and why is it important?

"There is a big data revolution, but it is not the quantity of data that is revolutionary. The big data revolution is that now we can do something with the data."

Gary King
Director of Harvard's Institute for Quantitative Social Science

BIG DATA AND MEDIUM DATA

Remove superfluous data tails



BIG DATA AND MEDIUM DATA

Key Definition

- Medium data can be structured and unstructured data, in which the volume, velocity and variety of data is easily captured, processed and analyzed by today's data analytic tools.
- Medium Data can contain all the valuable patterns and information that is typically associated with Big Data but in a size that is more easily manageable.
- 1 billion rows of static financial data, while it is a large data set, is really Medium Data.
- Big Data is 500 million rows of data that change every 30 seconds

IA ROBOTICS, MACHINE LEARNING AND THE FUTURE

What is all this and why is it important?

Robotics Process Automation is software that imitates human interaction with computer systems to accomplish tasks.

A “bot” can log into multiple systems, navigate user interfaces to add, update, or download data, check the status of a control or basically anything else a human can do. Except think…

IA ROBOTICS, MACHINE LEARNING AND THE FUTURE

What is all this and why is it important?

Machine learning is a subfield of computer science that evolved from the study of pattern recognition and computational learning theory in artificial intelligence. In 1959, Arthur Samuel defined machine learning as a "Field of study that gives computers the ability to learn without being explicitly programmed".

DATA ANALYTICS AND THE INTERNAL AUDIT FUNCTION

Board and C-Suite want more directed data-driven risk decisions

The Perfect Storm
Explosive growth in raw data, technological advances in data storing and analysis, looking for data-driven decision making with a board-directed focus on current and future enterprise risks along with high-risk entity analysis

DATA ANALYTICS AND THE INTERNAL AUDIT FUNCTION

What the future looks like

- The board looking for data-driven decisions on enterprise risk
- The C-suite looking for key risk and revenue analytics (how they impact one another) and their relevance to the organization
- The ability to “foresee” future risks before manifestation

DATA ANALYTICS AND THE INTERNAL AUDIT FUNCTION

How data analytics be applied to the Internal Audit function

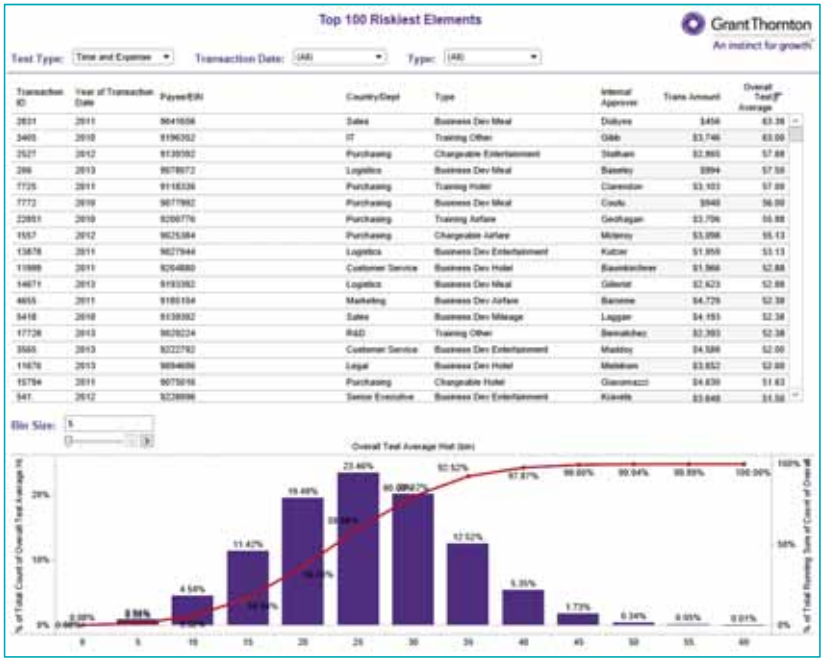
- **Historical Perspective:** Error detection and quantification
- **Continuous Review**: Continuous monitoring and continuous review
- **Future Perspective:** Key Risk Indicators along with predictive and prescriptive analytics

DATA ANALYTICS AND THE INTERNAL AUDIT

Historical Perspective

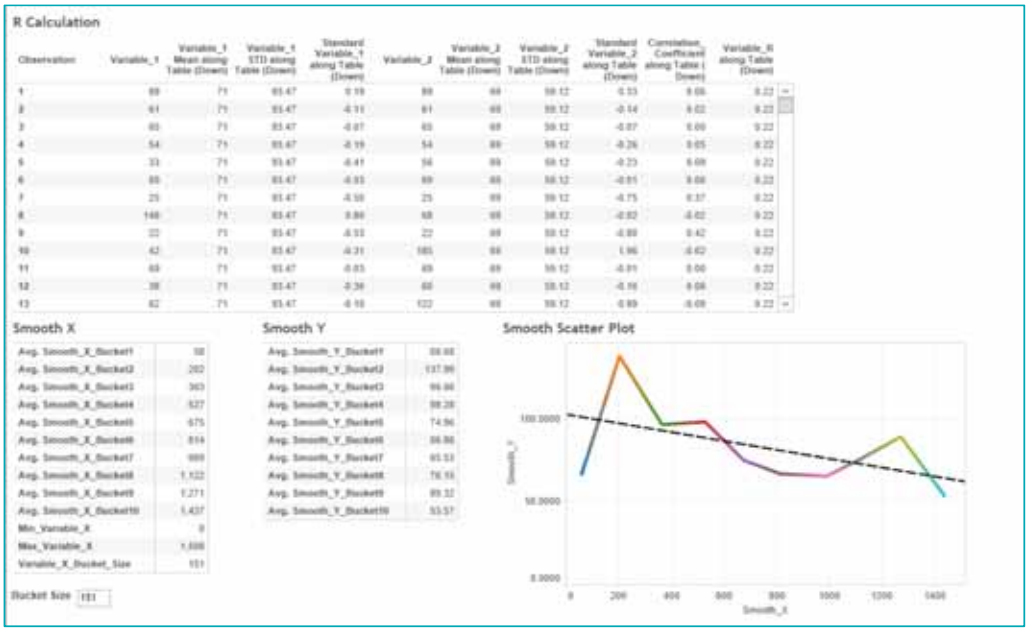
DATA ANALYTICS AND THE INTERNAL AUDIT

Continuous Review



DATA ANALYTICS AND THE INTERNAL AUDIT

Future Perspective



IIA DATA ANALYTICS BOOK

Research objectives

- Define Data Analytics within the Internal Audit dynamic
- Identify how Data Analytics is currently used by Internal Audit
- Highlight the gap of actual vs. possible uses of Data Analytics
- Inventory and compare commercial data analysis software
- Provide a vision of the "future of Data Analytics"

IIA DATA ANALYTICS RESEARCH

CAE Interviews (partia)

MK1

Slide 19

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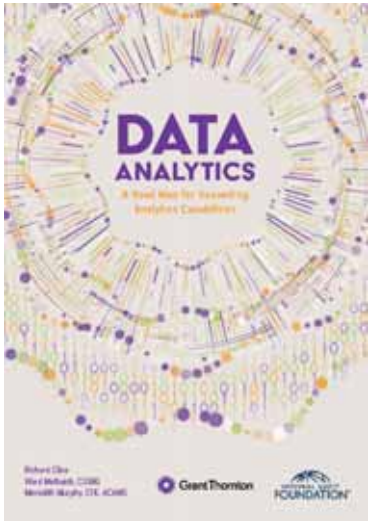
Mallick, Krishnendu, 3/12/2018

IIA DATA ANALYTICS BOOK



To obtain a copy of the book, visit the IIA Bookstore at bookstore.theiia.org

Data Analytics: A Road Map for Expanding Analytics Capabilities

The Institute of Internal Auditors (IIA) partnered with Grant Thornton to conduct research and provide subject matter expertise to shed light on the ever-changing uses of data analytics and how companies and internal auditors can — and do — harness analytics. Based on insights from the book, learn how businesses are using data analytics to drive digital transformation and growth.

- Data holds insight, but **it is people—not data—who ensure that analytics generates value for the company**.
- Advances in technology are raising expectations for leadership, creating new needs, and transforming the way we do business.
- Analytics is becoming a central focus of leadership agendas because of its potential to improve profitability, mitigate risk, and ensure a sustainable organization.

IIA DATA ANALYTICS BOOK

Key Takeaways from Research

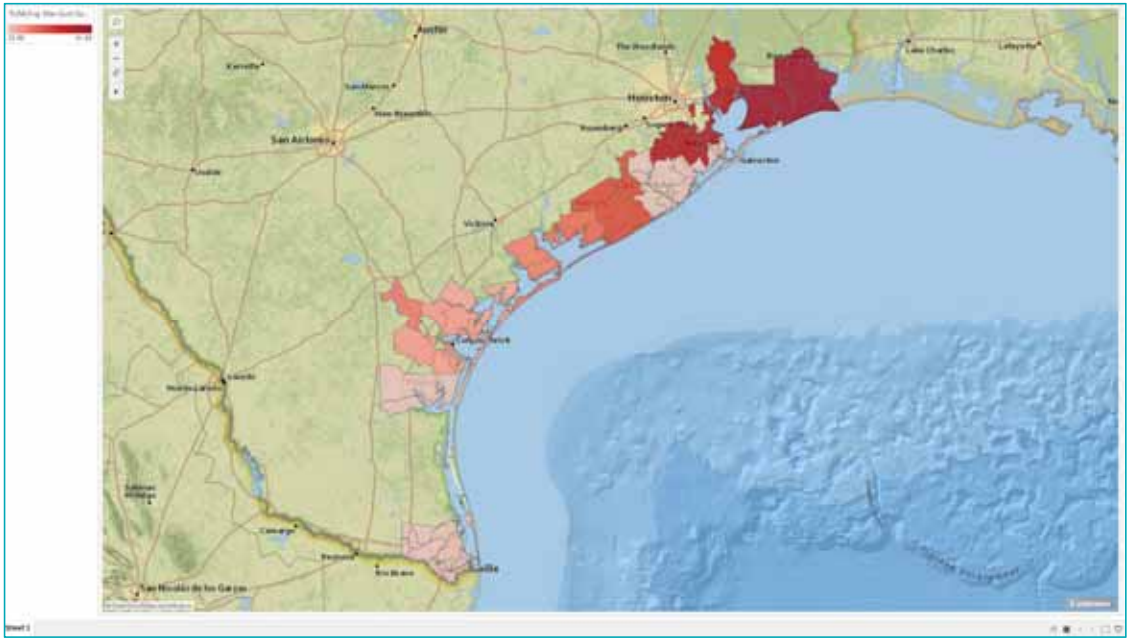
- Understand key components needed to drive analytic success.
- How to identify, define and score analytic priorities

- Determine the viability of use cases and validate the potential for generating value
- How to unlock analytics through a digital transformation strategy and analytic roadmap

ACTUAL EXAMPLES

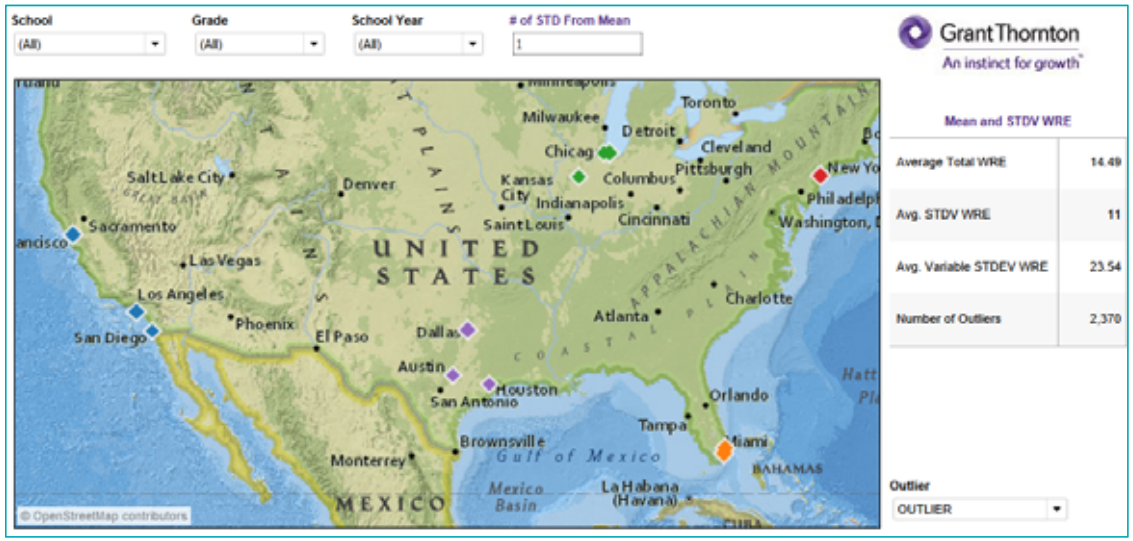
DATA ANALYTICS AND DATA VISUALIZATION

Hurricane Ike



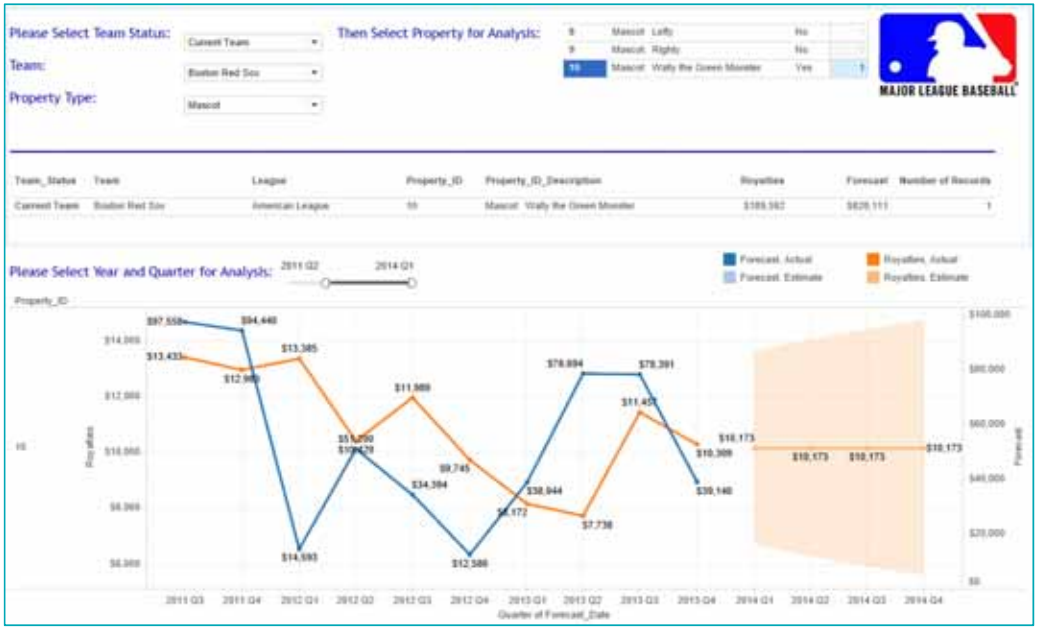
STUDENT TEACHER CHEATING STANDARDIZED TESTS

Hurricane Ike



DATA ANALYTICS AND DATA VISUALIZATION

Major League Baseball – Licensing Revenue



DATA ANALYTICS AND DATA VISUALIZATION

Geo Tracking

QUESTIONS AND ANSWERS?

END OF PRESENTATION

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THANK YOU FOR YOUR TIME AND ATTENTION!

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