



# **DATA ANALYTICS & CONTINUOUS AUDITING: EMBRACING THE NEXT GENERATION OF INTERNAL AUDITING**

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# Class Objectives:

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- Recognize opportunities to use data analysis technology to increase audit efficiency & effectiveness.
- Understand how auditors incorporate data analysis into the audit process from planning through reporting.
- Understand the challenges and risks when implementing data analysis technology.



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# Professional Expectations

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“Internal Auditors must have **sufficient knowledge of key information technology risks and controls and available technology-based audit techniques** to perform their assigned work.

However, not all internal auditors are expected to have the expertise of an internal auditor whose primary responsibility is information technology auditing.”

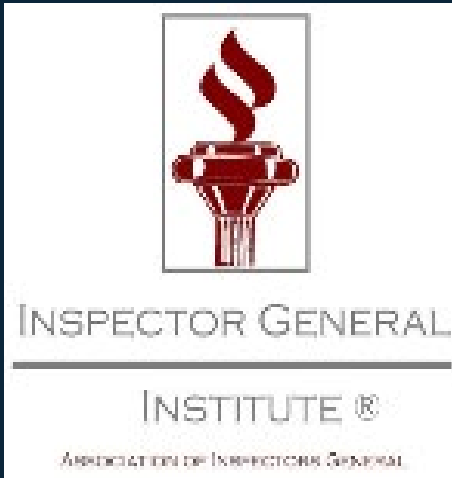
IIA Standards for the Professional Practice of Internal Auditing-  
Standard 1210.A3



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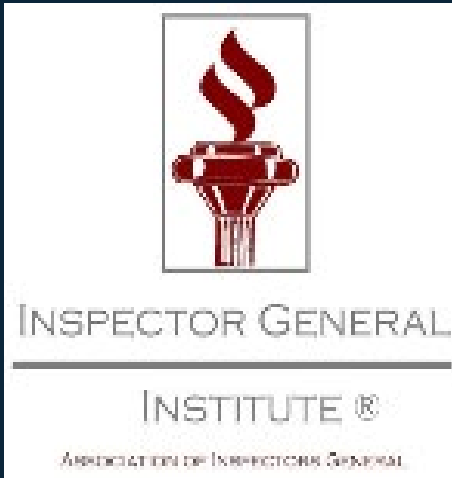


## IIA Global IA Competency Framework

### Expectation: Data Analytics

#### **Manager:**

- ❖ Ensures that the relevant tools and techniques are used during the business process analysis, and
- ❖ Selects and uses appropriate research, business intelligence, and problem solving techniques to analyze and solve complex situations.



## IIA Global IA Competency Framework

Expectation: Data Analytics

### **Both Staff & Managers:**

- ❖ Selects and uses a variety of manual and automated tools and techniques to obtain data and other information on business processes, and
- ❖ Applies data collection, data mining, data analysis, and statistical techniques.

# Technology Tools can be used in all phases of audit planning and performance\*

Engagement planning including assigning auditors to the audit team.

Performing the risk assessment and developing the work plan.

Performing the engagement.

Selecting samples and evaluating results.

Assessing the impact or root cause of deficiencies identified.

Developing monitoring tools for CM or CA.



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2200

2210

2300

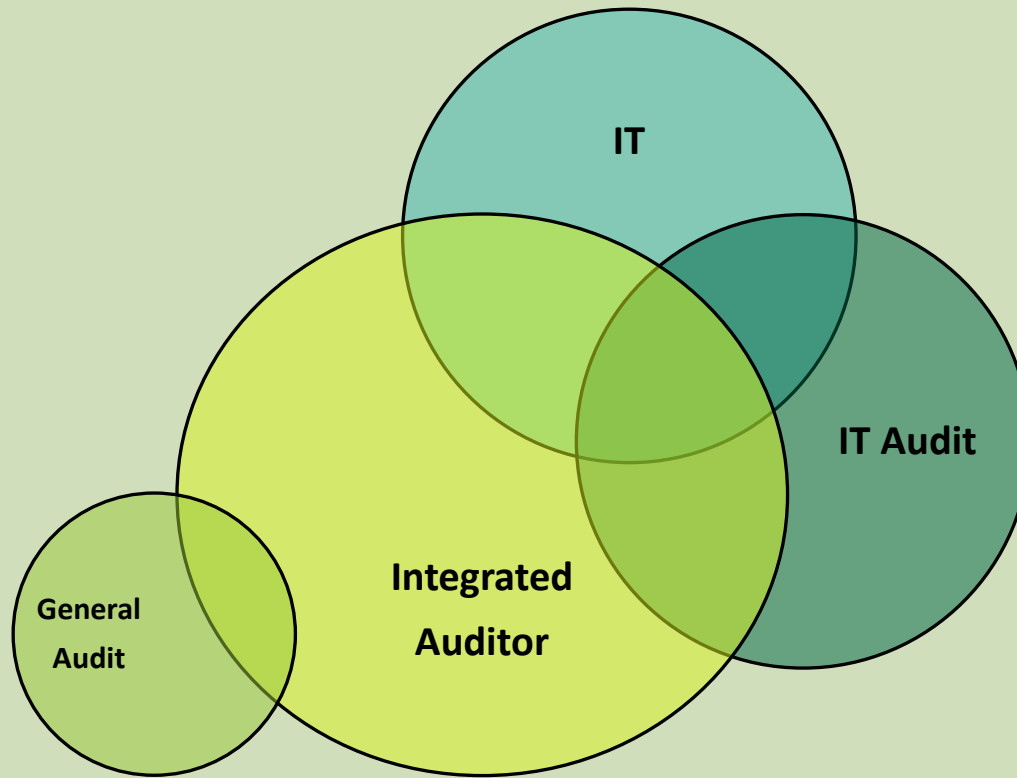
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## IIA: Data Analytics Mandate

### Part 1: Where do we go from here?

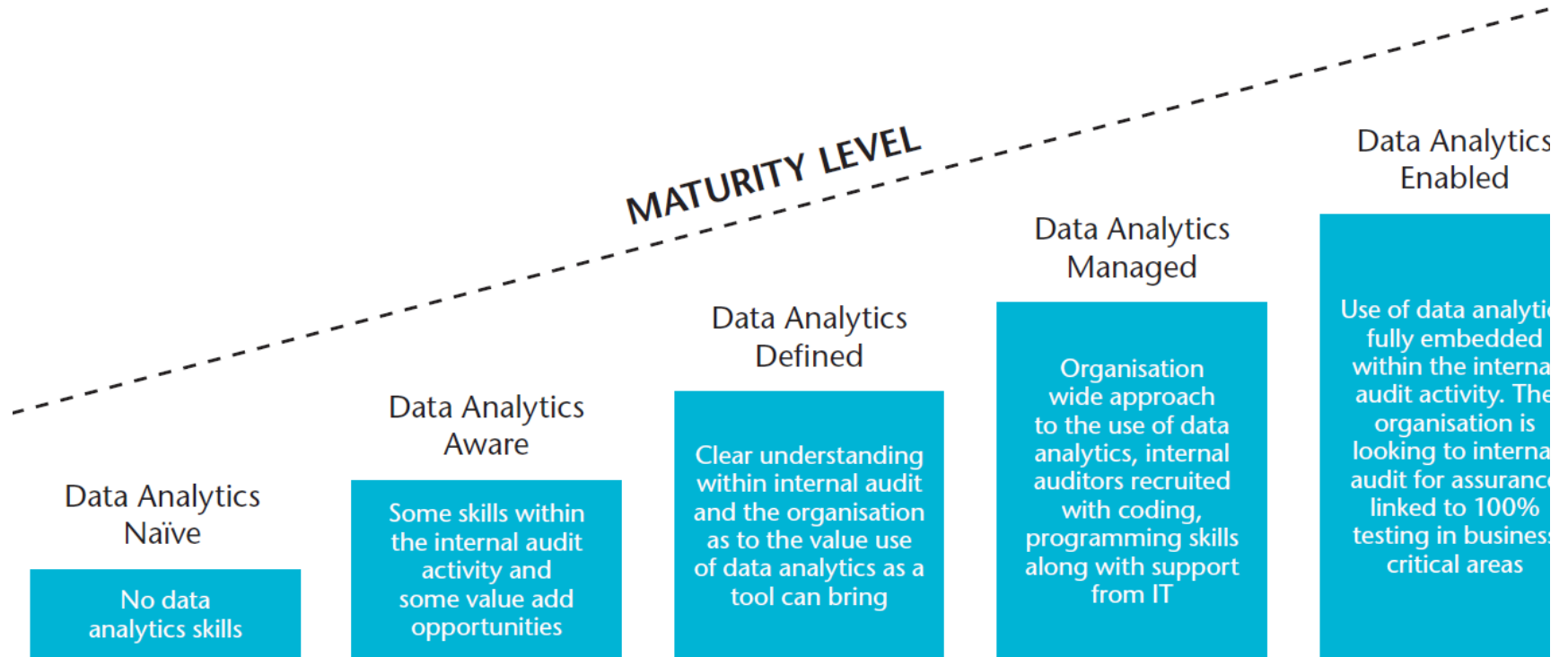
- Data Analytics has become a necessity rather than a desire.
- Auditors must use the tools at its disposal to “audit at the speed of risk” which is moving faster every day.
- Legacy industries may not be as nimble as others in implementing drastic change, including data analytics.



# Adapting to the Changing IT Audit Landscape



The data analytics maturity journey linked to business requirements, assurance, internal auditor skills, experience and available funding



# Chartered Institute of Internal Auditors

## Data Analytics: Is it time to take the first step? April 2017



## IIA: Data Analytics Mandate

Part 1: Where do we go from here?

# Categories of Data Analytics

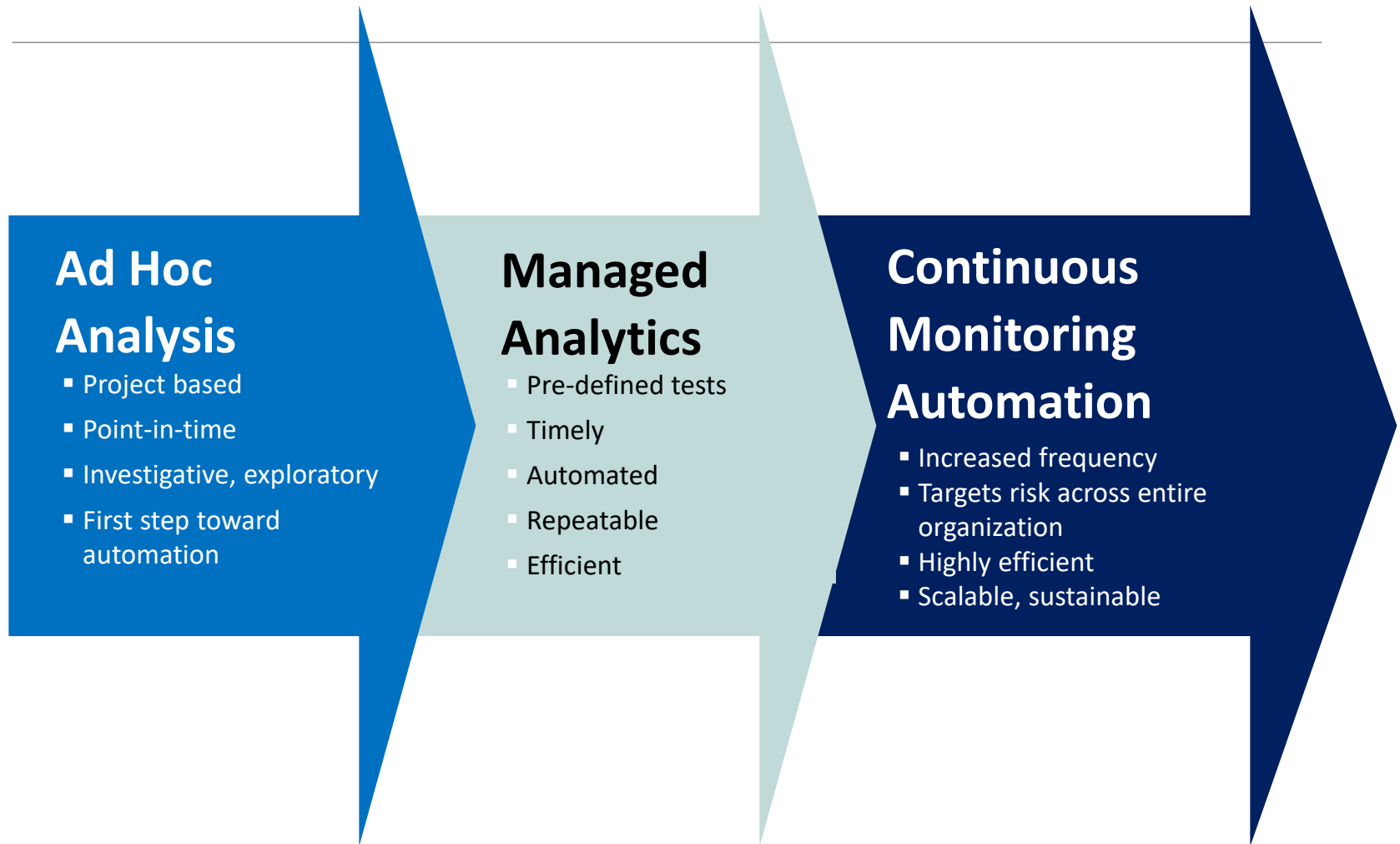
Descriptive

Diagnostic

Predictive

Prescriptive

# Traditional Methodologies; Focused on Internal Controls



# Transforming Internal Audit through Data Analytics\*

Area	Opportunity
Planning/Risk Assessment	Leverage existing analytics to measure risk Identify anomalies, patterns, and trends in data Assess data quality
Work Plan/Scope	Determine monetary value, cyclic nature of activity, complexity of operations, dispersion across organizational units
Plan Execution	Allows for 100% testing or statistical sampling Assists with work paper development Provides audit evidence
Issue Identification	Allows quantification of risk Identify common control failures in exceptions
Reporting	Provides data used for visualization
Implementation	Management has tool to monitor or mitigate risks

How Analytics will transform Internal Audit, ISACA Journal Vol 2, 2017

# Adapting to Changes in the IA Data Analytics Landscape

## Continuous Audit

- Automation of routine tasks, control testing, and monitoring

## High Impact Reporting

- Clearer picture of risk, root cause

## Agile Audit Approach

- Increased emphasis on strategic risk
- Quicker turn around time

## Dynamic Risk Assessment

- Automation of known risk monitoring



## 2019 IA Capabilities and Needs Survey by PWC

## Next Generation Methodologies

	High	Medium	Low
Continuous Monitoring	49%	33%	12%
High Impact Reporting	53%	26%	11%
Agile Audit Approach	52%	28%	12%
Dynamic Risk Assessment	51%	24%	14%



## 2019 IA Capabilities and Needs Survey by PWC

Availability of  
skills among  
organizations  
adopting these  
methods

	Yes, have skills	No, but training planned	No, don't have skills
Continuous Monitoring	47%	36%	8%
High Impact Reporting	41%	35%	12%
Agile Audit Approach	38%	35%	14%
Dynamic Risk Assessment	39%	34%	14%

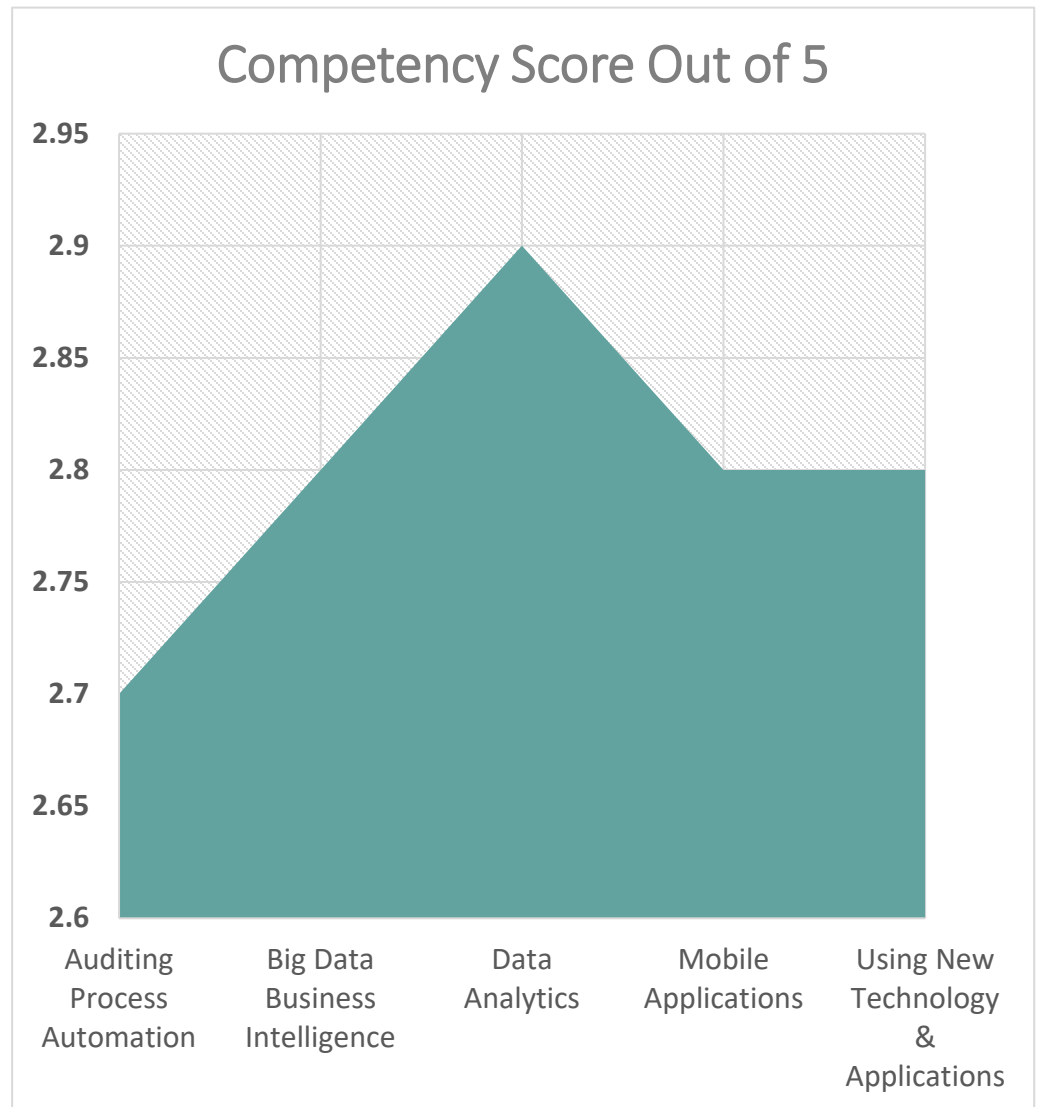


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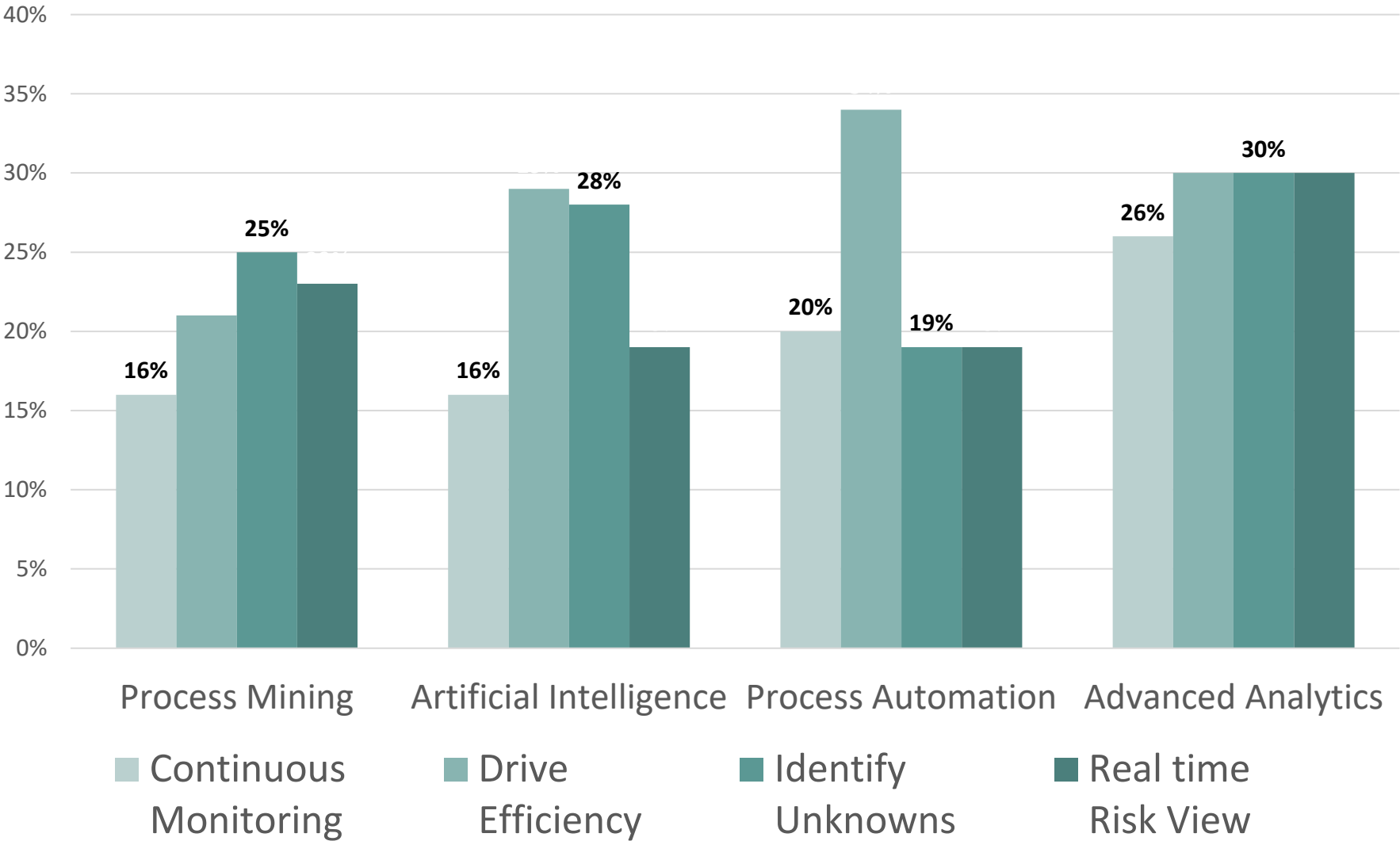
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## 2019 IA Capabilities and Needs Survey by PWC





Reason for Enabling Technologies

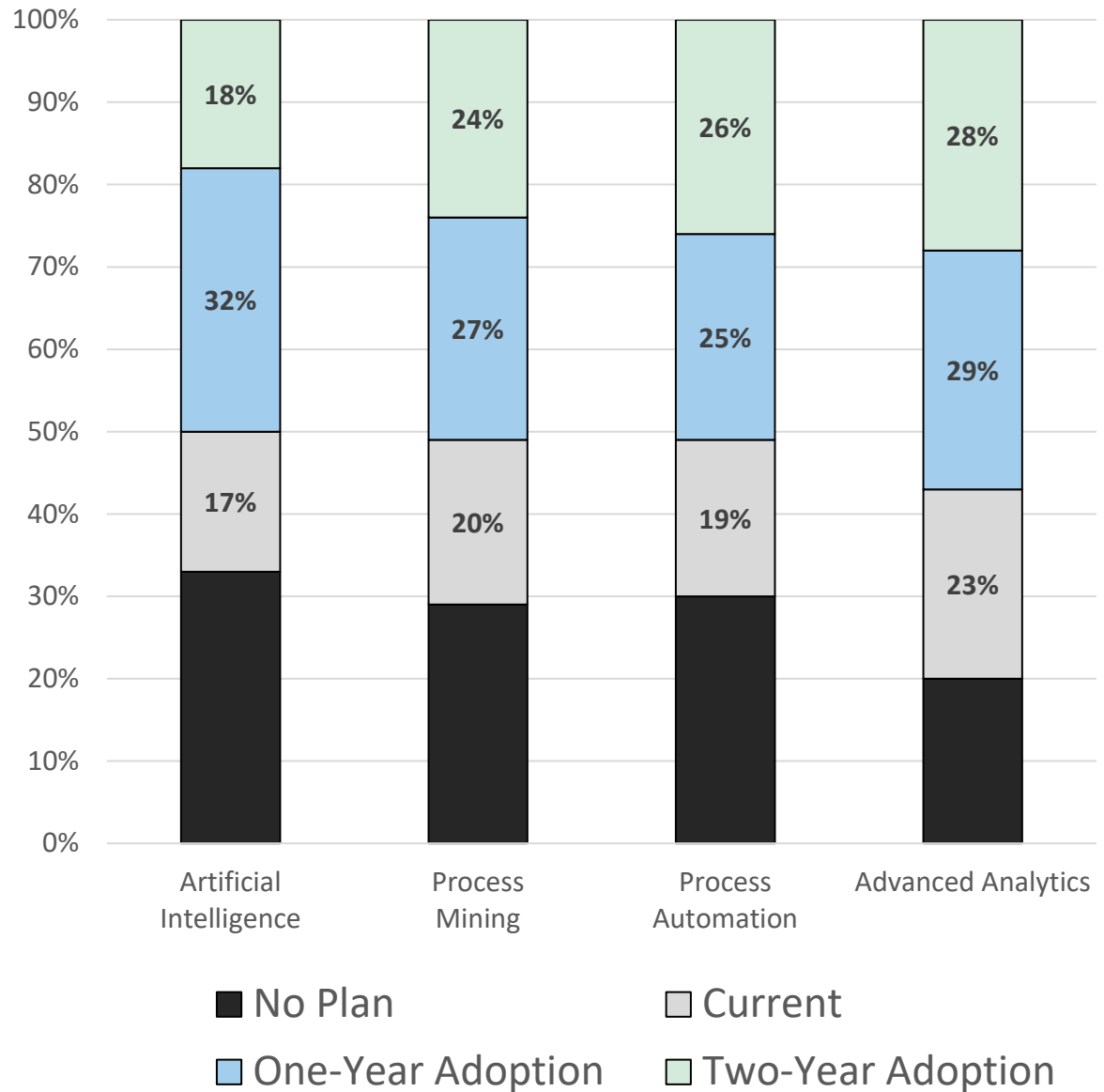




## 2019 IA Capabilities and Needs Survey by PWC

## Adoption of Enabling Technologies

Status of Enabling Technologies



# Where is all this data coming from?

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- Data Warehouses/Cloud Storage
- Business Intelligence Platforms
- Transactional Systems of Record
- Point of Sales Systems
- External Partners
- Public Data Sources



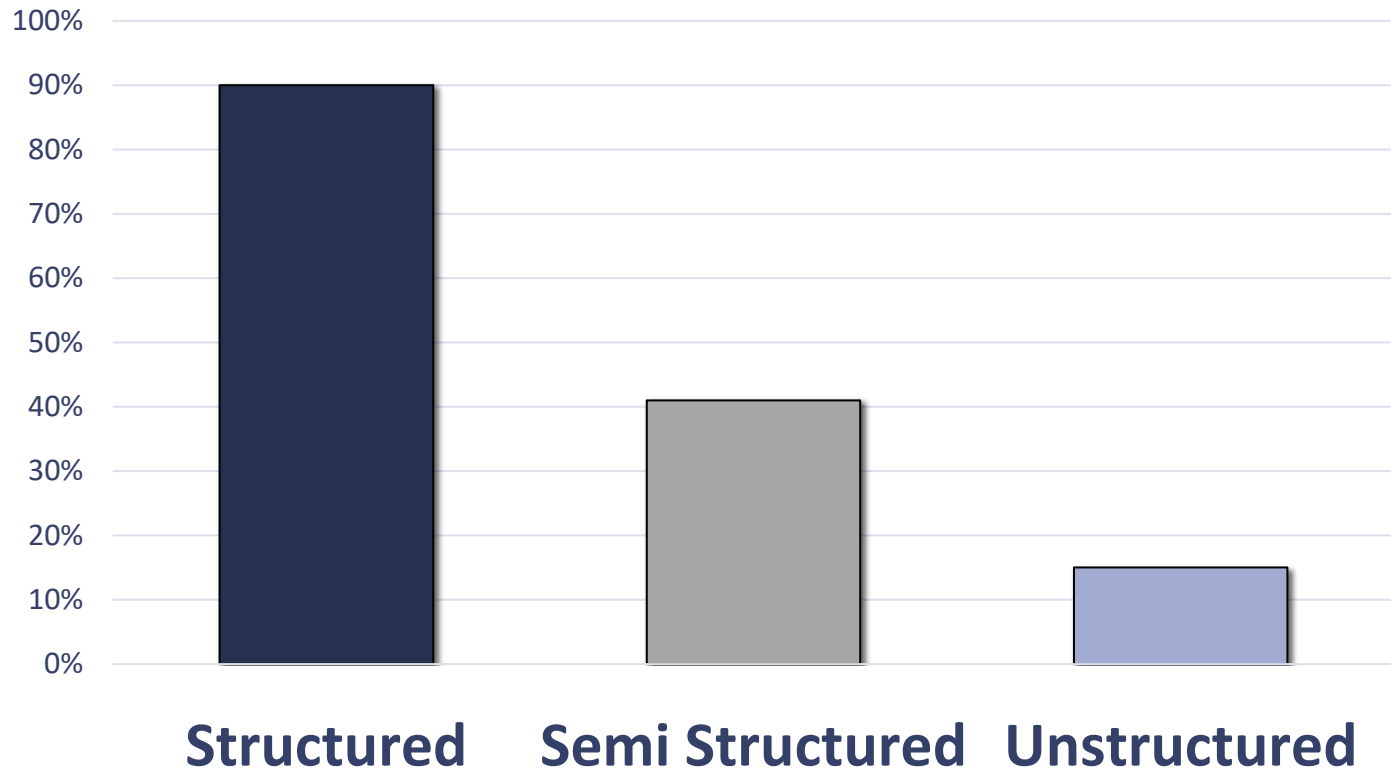
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# Data Use by Type

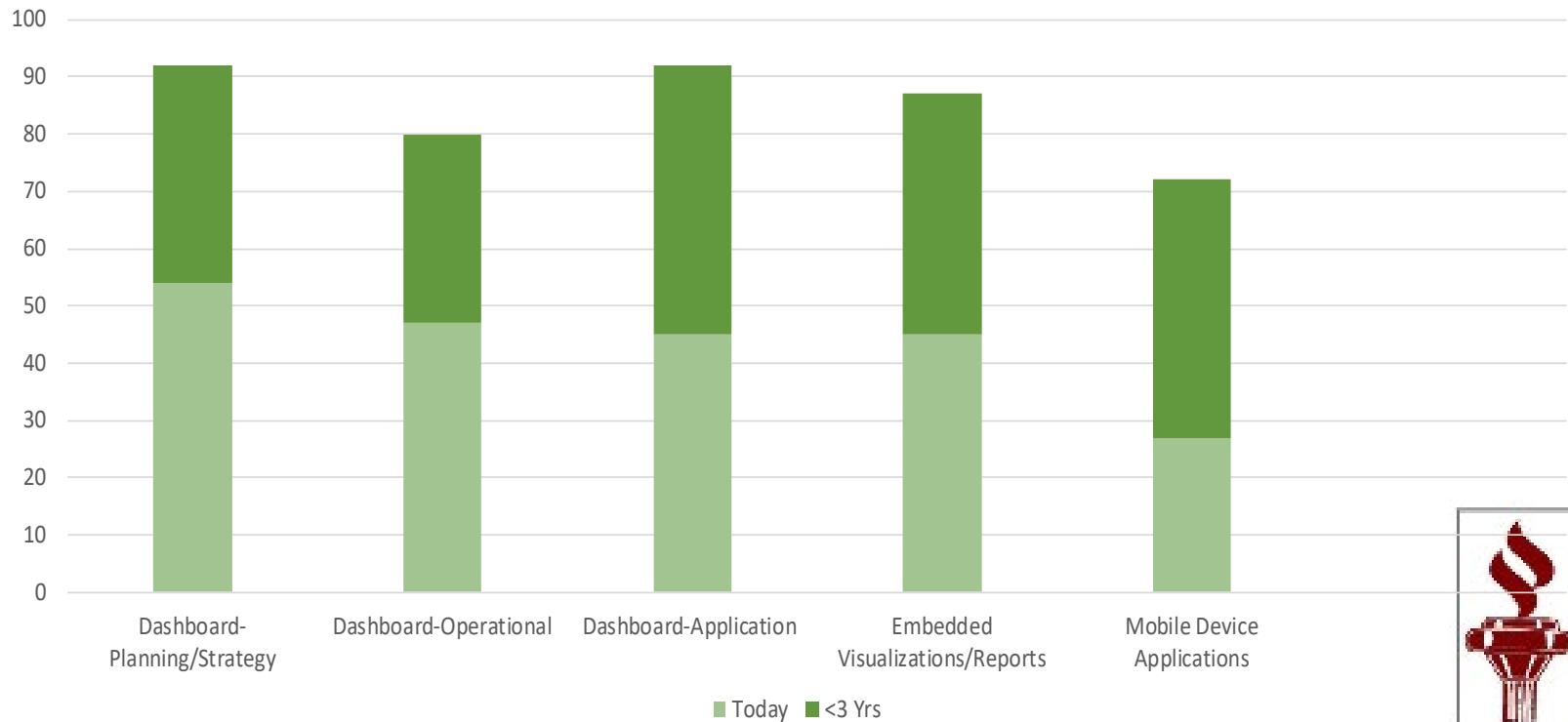


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# Organizations are Operationalizing and Embedding Analytics



TDWI Research 2015, “Operationalizing and Embedding Analytics for Action” by Fern Halper



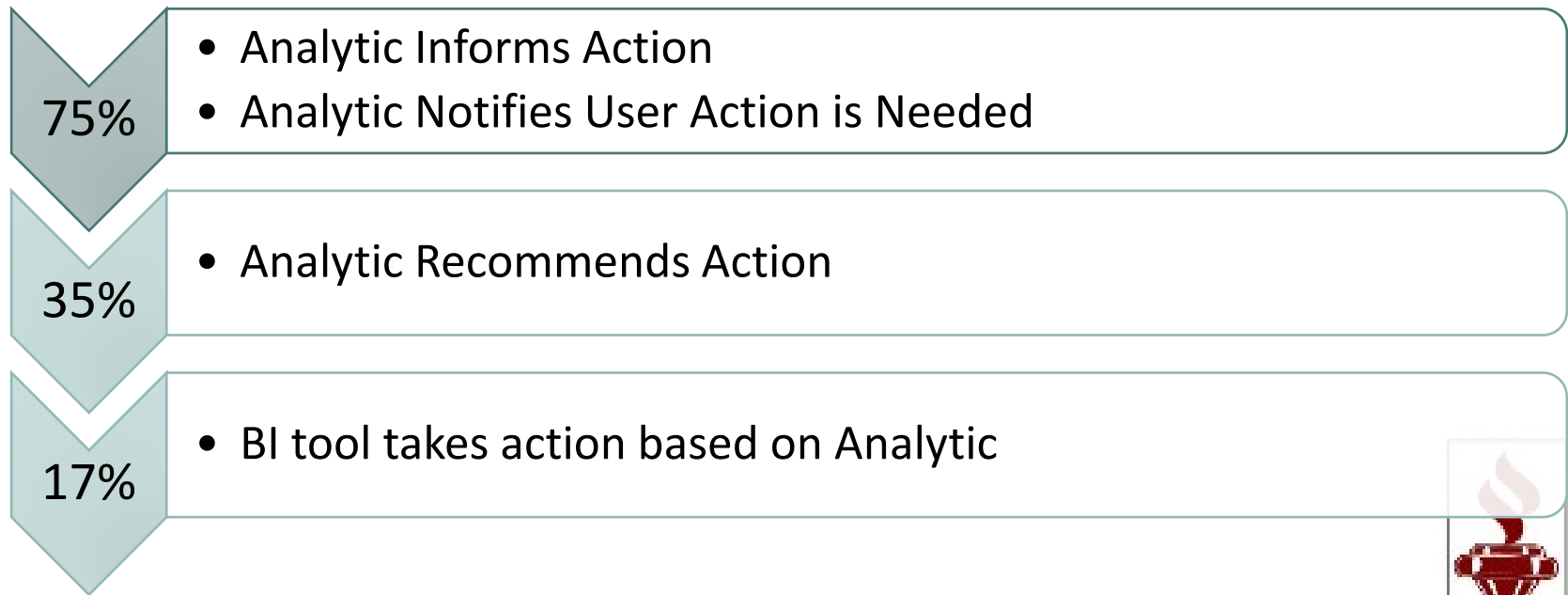
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# Analytic Response

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TDWI Research 2015, “Operationalizing and Embedding Analytics for Action” by Fern Halper



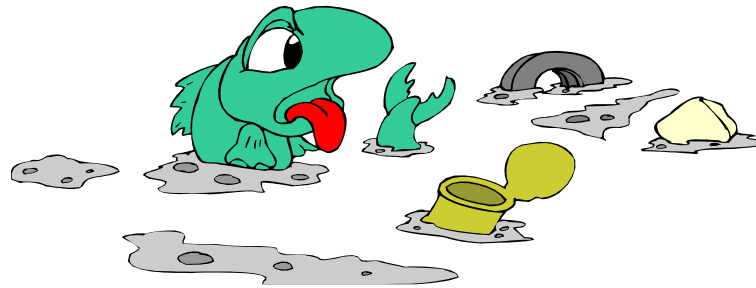
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# The Challenge

## Data Integrity & Availability





## GTAG 16 Data Analytics

### Audit Risk & Data Integrity\*

An effective data analysis technology for audit purposes:

- Must protect the integrity and quality of data.
- Must be able to access and analyze data without altering it or subjecting it to accidental change.
- Must preserve the accuracy and completeness of the data to prevent the skewing of analytical results.
- Must be able to identify data quality errors in the source data.



# Data Challenges



Poor data quality

Data is not integrated

Lack of available data

Insufficient knowledge of  
institutional data

# The Challenge

Data Integrity & Availability

**Managing Expectations & Risks**





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- ☐ Unrealistic expectations by management.
- ☐ Unwillingness of management to take action when issues are identified.
- ☐ Advanced data analytic tools use algorithms which may not perform as expected or deliver misleading results.
- ☐ Programmatic errors.
- ☐ Machine learning based on predications can amplify existing biases and can learn to discriminate.
- ☐ Systems that use large amounts of data must comply with data privacy regulations.

# The Challenge

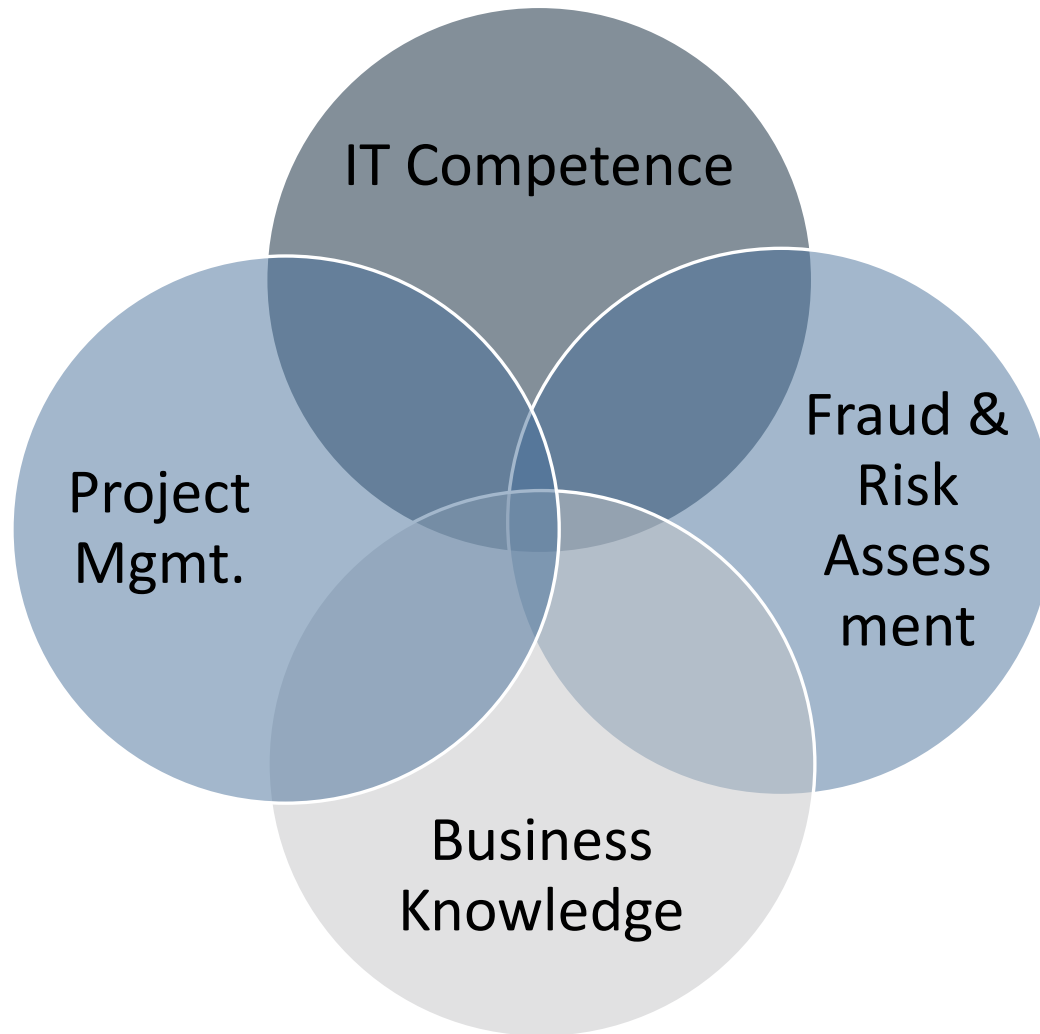
Data Integrity & Availability

Managing Expectations & Risks

**Building the Right Team (Expertise)**



# Core Skills of Team\*



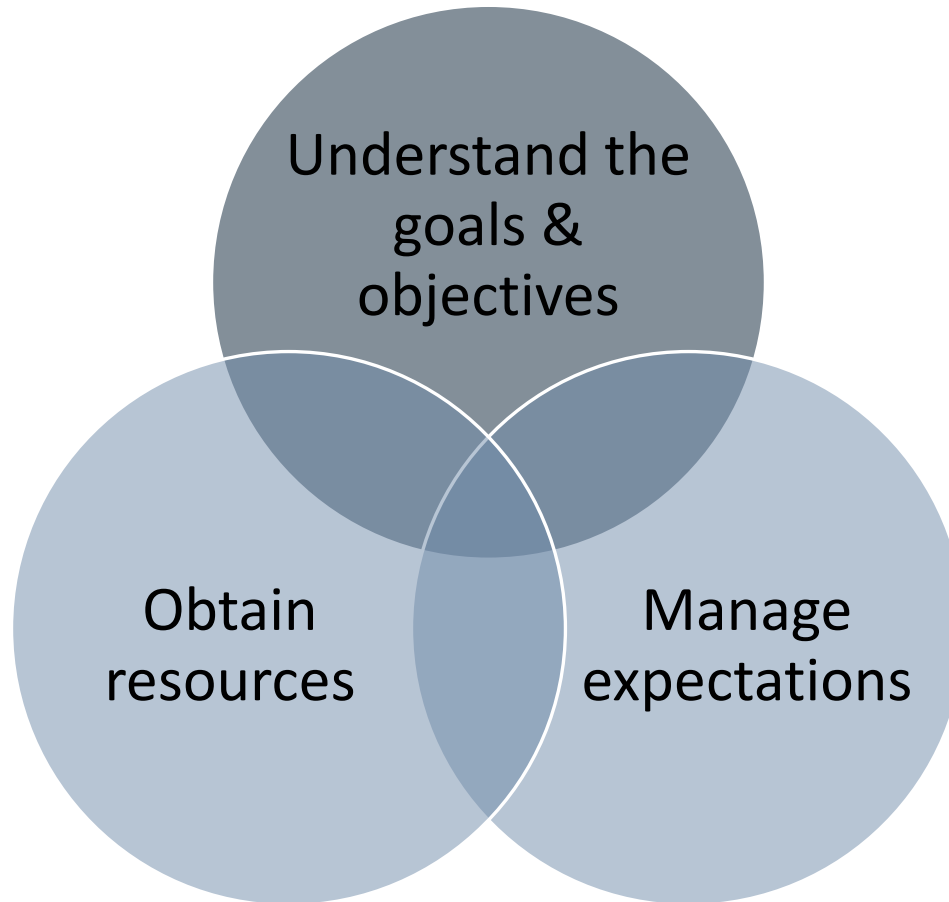
# Rocky The Bull





# Role of a Data Champion\*

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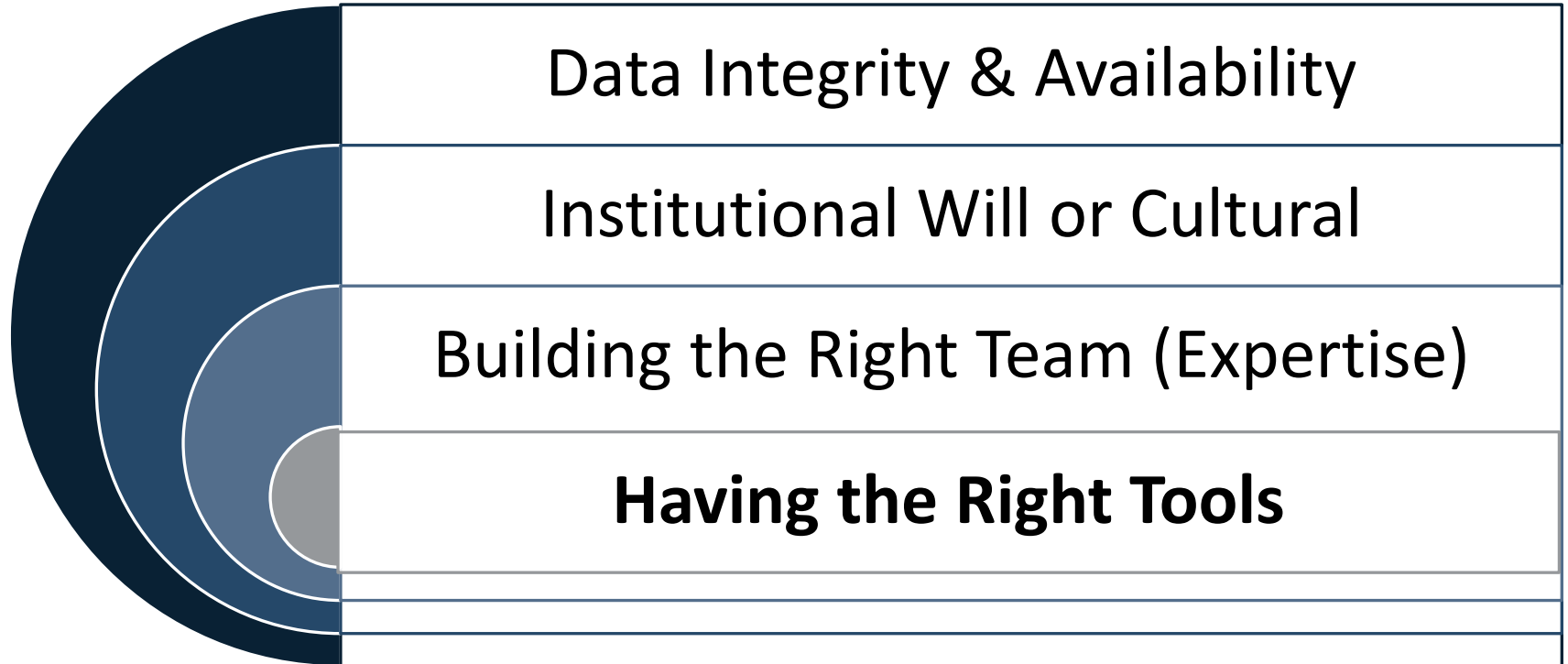


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# The Challenge





# Tools



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Data Analysis

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Data Visualization

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Text Mining Tools for  
Unstructured Data

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Business Intelligence Software

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# Approaches to Transactional Analysis

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- Analytical/attribute approach
- Relational approach
- Trend/ratio analysis



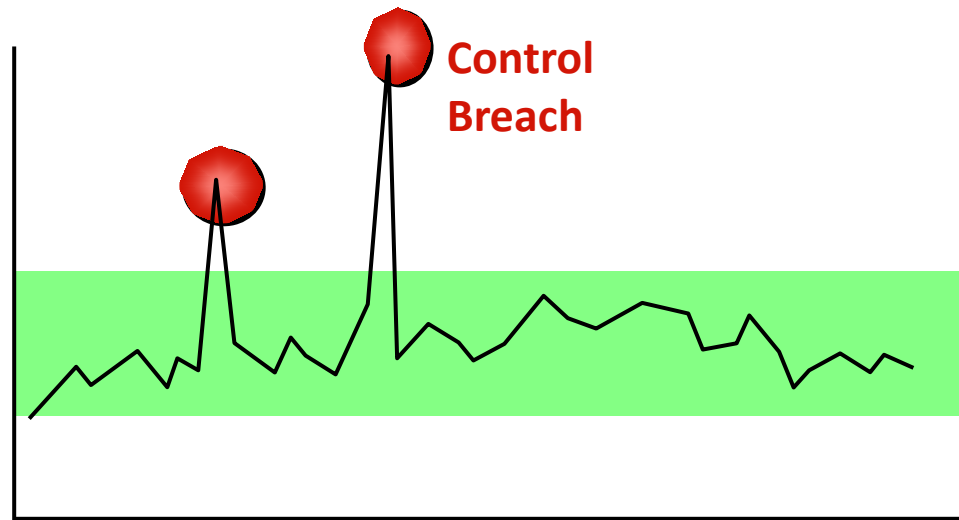
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# Analytical Approach: Anomalies

A review of large population for “unusual items”, to isolate “red flags” and drill down to transactions.

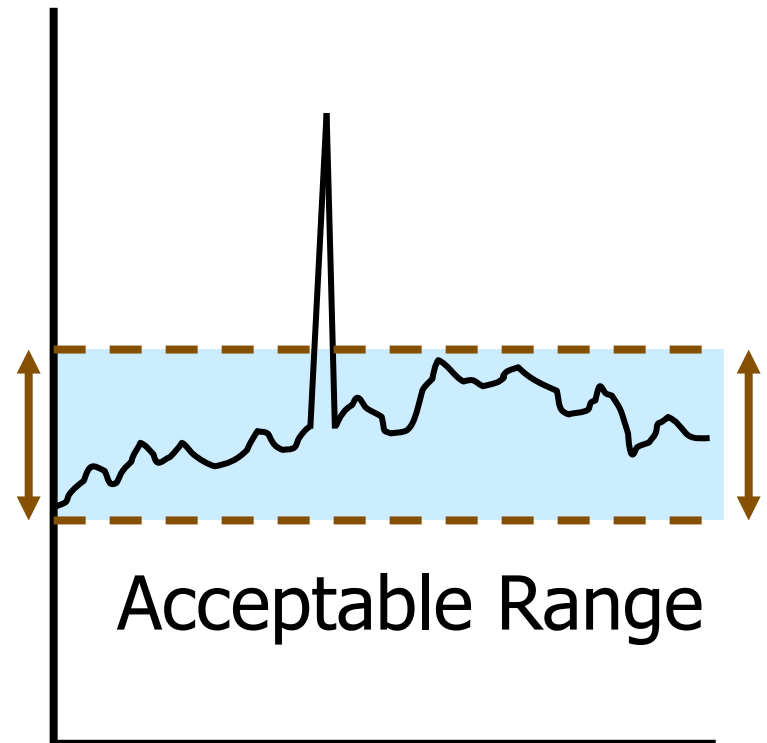


# Analytical Approach Examples

- Unreasonable dual compensation & overload payments.
- No date in critical fields (SSN, invoice #, check #, addresses).
- Un-posted or unmatched transactions.
- Significant change or excessive pay rates/hours/effort.
- Adjustments to inventory (missing, lost, or stolen) is significant.
- Large number or percent of adjustments, discounts, credits, corrections by same user.

# Attribute Approach

Begin with entire population and filter for transactions matching specific criteria or known flags or critical control attributes, like segregation of duties.



# Attribute Approach Examples

- Same address, multiple vendors.
- Expenditures just below thresholds.
- Large adjustments entered by management.
- Examination of transactions on odd dates/times.
- Concentration of duplicate payments by one employee.
- Transactions processed by managers or above.

# Attribute Approach Examples

- Number of deletions or adjustments to key fields.
- User access not compatible with job.
- Multiple pay checks to same account.
- Bill flag is NOT turned on.
- Excessive use of override (match exceptions).
- Remit to name/address is different than vendor name.
- Ship-to address is not institution's address.

# Segregation of Duties

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Online authorizations are making it easier to verify that proper segregation occurs. While this will not prevent collusions, this is one area where application controls can be used to reduce risk and/or management exception reporting, if adequate application controls do not exist.



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# Relational Approach

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Compares separate data files and looks for disparities or matches and uses relationships between fields/files to identify anomalies.



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# Relational Approach Examples

- Online leave vs. business travel (paying for personal travel).
- Procurement card charge and direct reimbursement.
- Expenditure transfers (out) without related charge (in).
- No travel report for travel-related procurement card charges.
- Data in vendor file matches employee master file.
- Open production orders with billed sales.
- Outside vendor orders per organization orders.

# Cross Tabulations

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- Accumulates and compares related data.
- Data preparation for further analysis.
- Data inconsistencies are easily identified.



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# Examples: Employee Pay

EMPLOYEE	REG	OT	HOL	VAC
Smith	2000	15	65	15
Jones	263	69	35	0
Allen	2080	375	0	0
Hernandez	1900	0	65	115
Ward	2080	0	0	0



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## Ability to predict affected by:

- Level of aggregation: More disaggregated, the more precise.
- Accuracy/reliability of the data.
- Internal data may be more predictable than external.
- External data may be more reliable than internal.
- Nature of the account or assertion: Subjectivity, management's discretion, stability.
- Income statement more predictable than balance sheet.

# Trend/Ratio Analysis

- Trend Analysis: Comparison of data sets (prior periods, other locations, similar entities) in order to identify irregularities.
- Ratio Analysis: Ratio of one account's activities in relationship to another's to track trends and identify problems.
- Regression Analysis: Statistical method of examining a series of records to determine reasonableness. One or more variables is used to predict value and predicted value is then compared to actual value.

# Trend Analysis Factors

- Data must be stable, or predictable.
- Aggregate data affects precision.
- Longer the trend term, the more reliable.
- Least precise method:
  - \_ Assumes a constant environment.
  - \_ Assumes historic data is valid.
  - \_ No adjustment for factors which affect account.
  - \_ Permits only one predictor, no external data.

# Ratio Analysis

- Relationship must be stable and predictable.
- Imprecise with aggregated data.
- Useful in comparing balance sheet & income statement relationships.
- Useful when size of one account is related to size of another account
- More precise but...
  - \_ Relies on constant relationship.
  - \_ Permits only two predictors.
  - \_ Limited use of external data.



# Regression Analysis

- Statistical method of examining a series of records to determine reasonableness.
- One or more variables is used to predict value.
- Predicted value is then compared to actual value.



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# Regression Analysis

- Useful in estimating unstable, yet predictable accounts.
- Relationship can be linear or non-linear.
- Data integrity is critical.
- Precision tied to assumptions made.
- Data should be un-aggregated.
- Level of precision highest:
  - Can be calculated.
  - Permits multiple predictors.
  - Explicit rather than implicit.