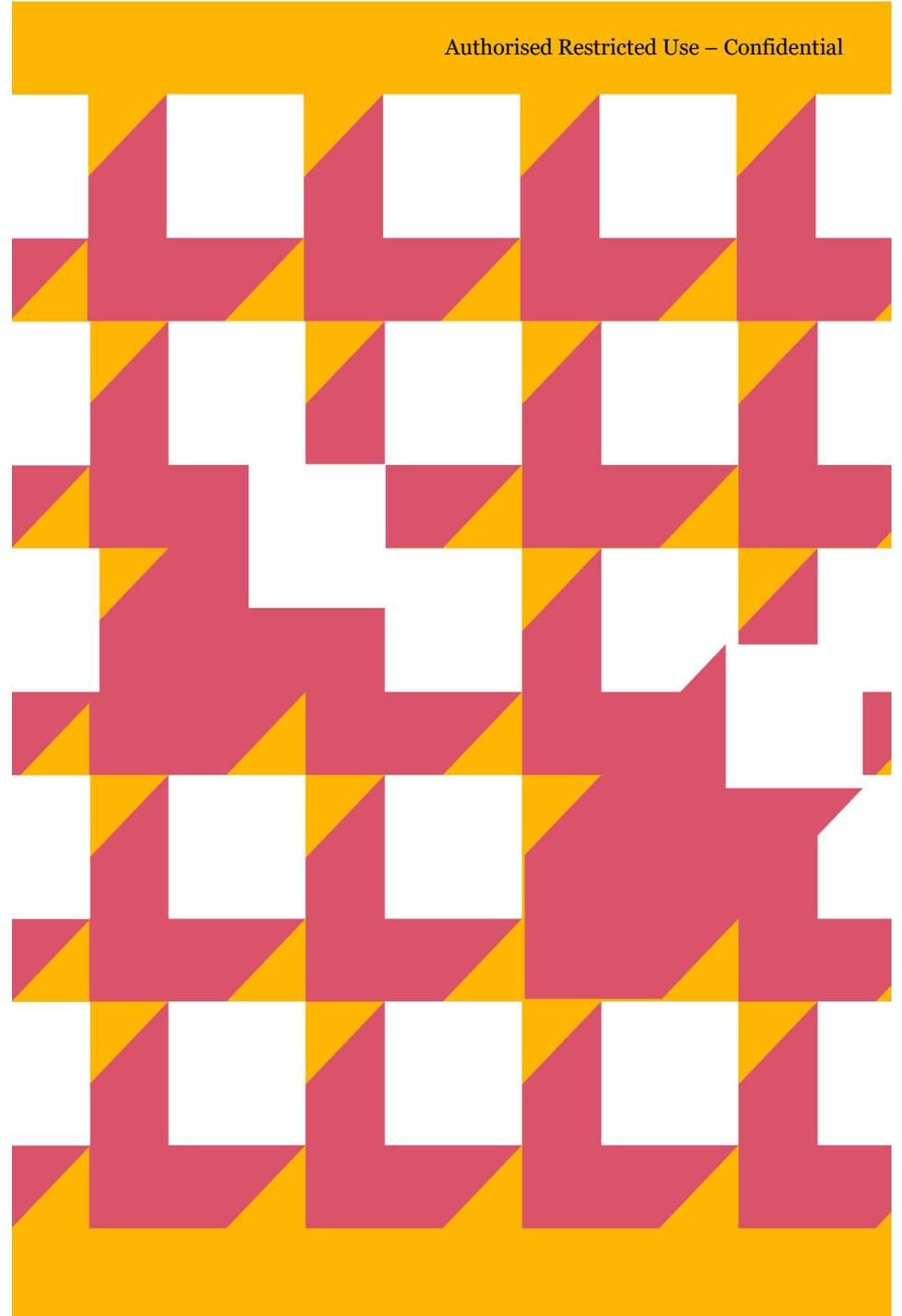# IA Transformation to Data Analytics

April 2019

pwc

Agenda

1. Data Analytics in Internal Audit
2. Data Analytics Tools
3. Example of Data Analytics
4. Barriers to Success

1. Data Analytics in Internal Audit

About PwC's 2019 Global Risk, Internal Audits and Compliance result

Elevating internal audit's role: The digitally fit function
2019 State of the Internal Audit Profession Study

PwC's Global Risk, Internal Audit and Compliance Survey shows that as organizations move through digital transformation, internal audit functions that are more...

Being a smarter risk taker through digital transformation
2019 Risk in Review Study

Our study into the digital fitness of risk management, compliance, and internal audit functions—which we call, collectively, risk functions—shows that risk...

Compliance on the forefront: Setting the pace for innovation
2019 State of Compliance Study

Compliance and ethics programmes that are digitally enabled and data-driven bring a clearer line of sight into evolving regulations so leaders can anticipate...

The six habits of risk and compliance functions that fuel smarter risk taking

Six habits of dynamic internal audit, risk and compliance functions

01 Go all in on the organisation's digital plan

02 Upskill and inject new talent to move at the speed of the organisation

03 Find the right fit for emerging technologies

04 Enable the organisation to act on risks in real time

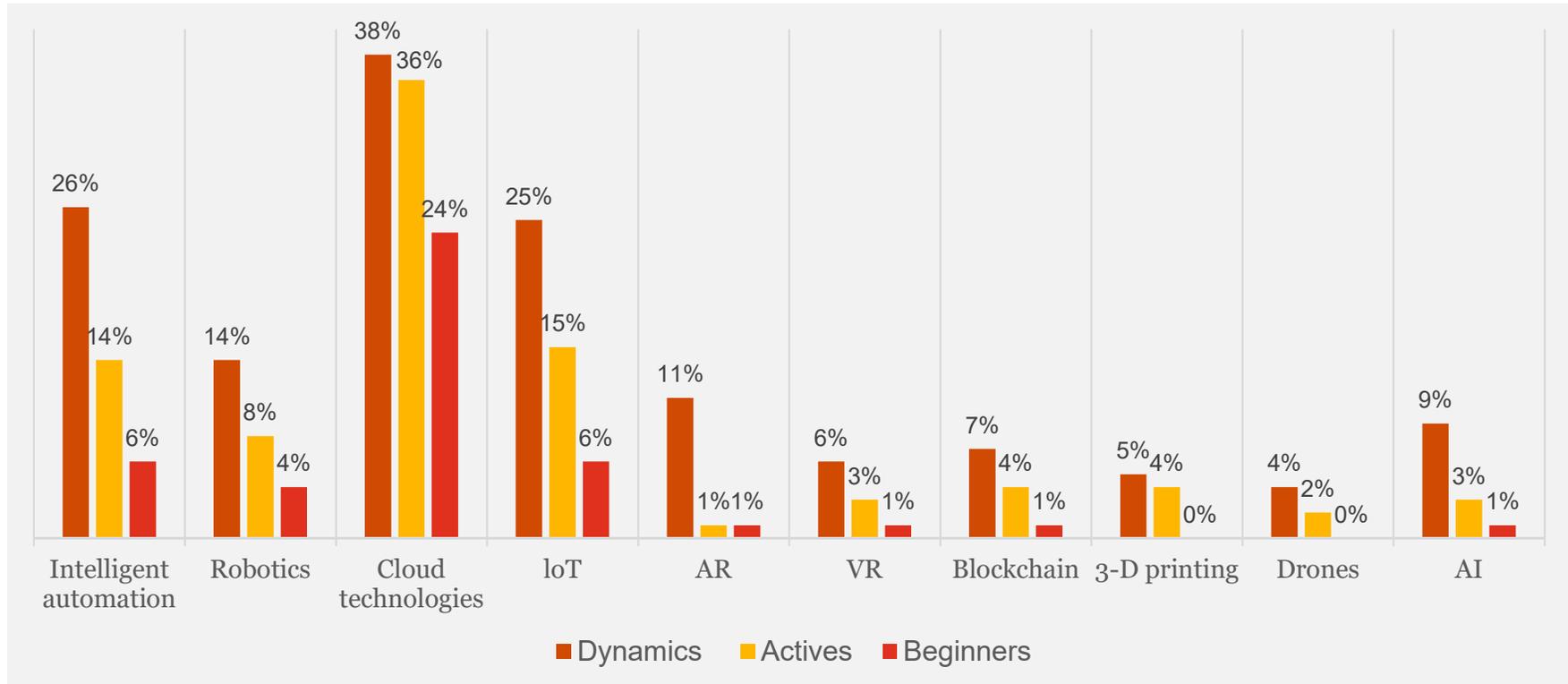**05** Actively engage decision-makers of key digital initiatives

06 Collaborate and align to provide a consolidated view of risks

Internal audit focused

Emerging technologies

My internal audit function is fully staffed and capable of auditing or in the past 12 months has audited an area that uses this technology.

Q. Which of the following best describes **your current preparedness to audit each of the following new technologies**?
Base: 98 Dynamics; 140 Actives; 271 Beginners

Source: PwC's 2019 State of Internal Audit study

Dynamics are pushing hard to use data in new ways

Visualisation tools built on a common data set also contribute to an organisation's ability *to act on risk in real time*.

Example:

S&P Global (Nancy J. Luquette; CAE (oversee IA, Risk management and Rating risk review))

"We began the effort within Internal Audit by giving the business real time audit status updates and now our audit universe is also digital using the tool…
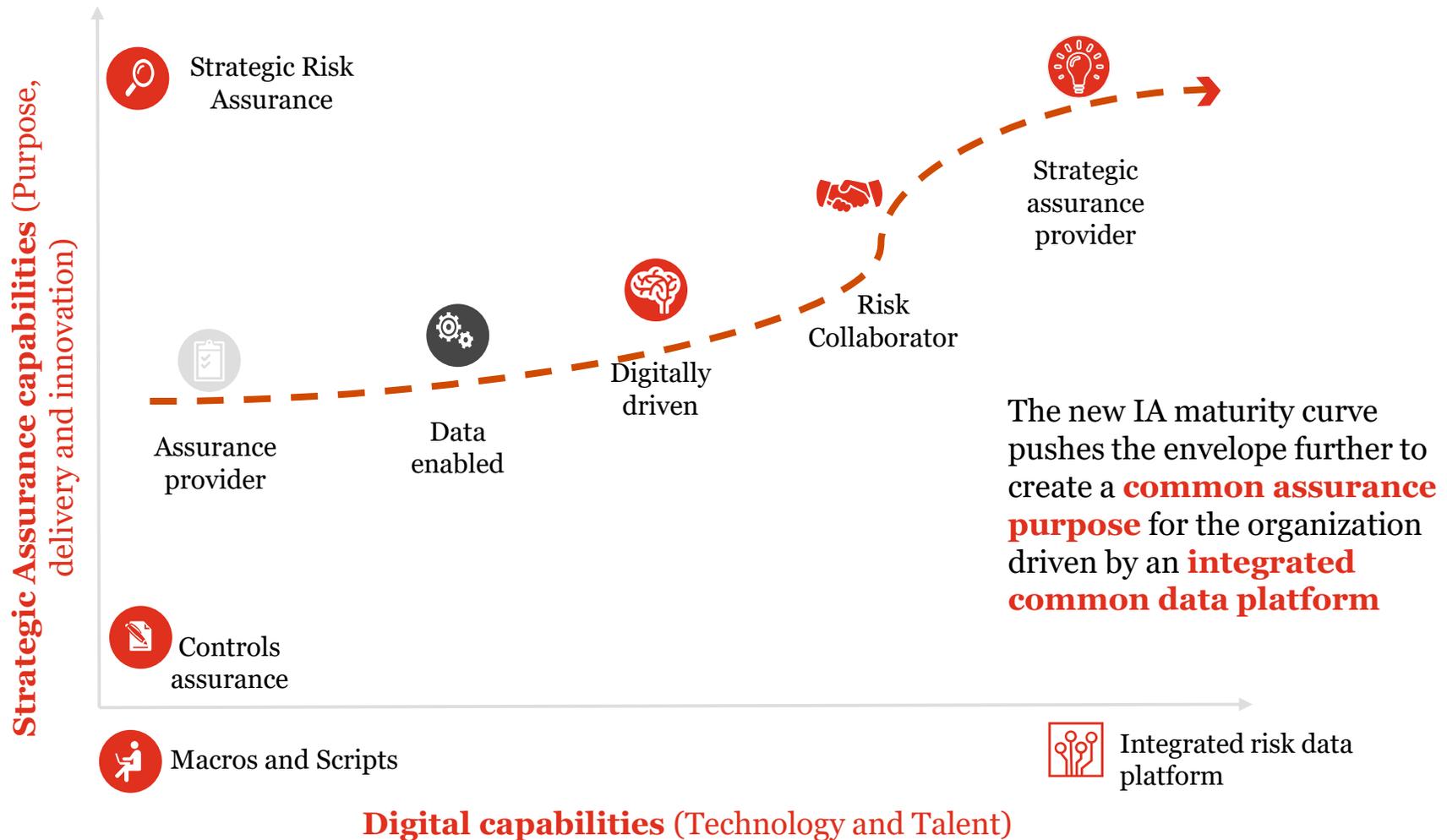
- Business leader can know the status of a particular audit is and how many action plans are due

- With digital audit universe, AC can see all high risk entities in a quick click and drill down the details….."

"Our products, services and/or business model can significantly change within six months. So I don't know what I'll need in two years. I don't have a three year audit plan. My one year plan changes every three months."

Melvin Flowers
Corporate Vice President, IA
Microsoft Corp.

Recalibrating the IA maturity curve

Historically the maturity curve has been from **"Assurance provider to Data enabled"**, which is the starting point of the new curve.

Strategic Assurance capabilities (Purpose, delivery and innovation)

Strategic Risk Assurance

Strategic assurance provider

Risk Collaborator

Digitally driven

Assurance provider

Data enabled

The new IA maturity curve pushes the envelope further to create a **common assurance purpose** for the organization driven by an **integrated common data platform**

Controls assurance

Macros and Scripts

Integrated risk data platform

**Digital capabilities** (Technology and Talent)

Benefits of using data enable audit

Data enable audit explores 100% of data across key financial processes in one integrated application. The interactive visualisation tools within the dashboard allow for persona defined perspectives, helping inform clearer and more insightful decision-making at the appropriate levels.
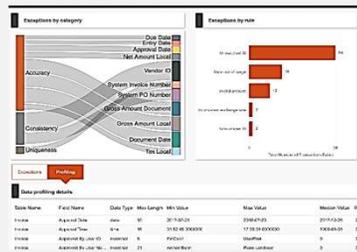
Highly visual

Move away from text based reports to highly visual and interactive dashboards that show patterns and insights more clearly.
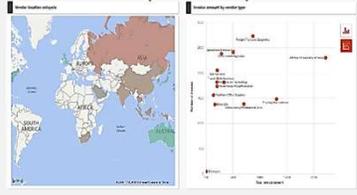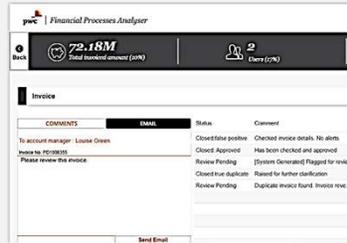

New insights on data quality

Visualise master files to easily identify where the data quality issues are for remediation.

Manage exceptions

Drill through and explore exceptions identified, and record live updates of actions taken, all within the tool.

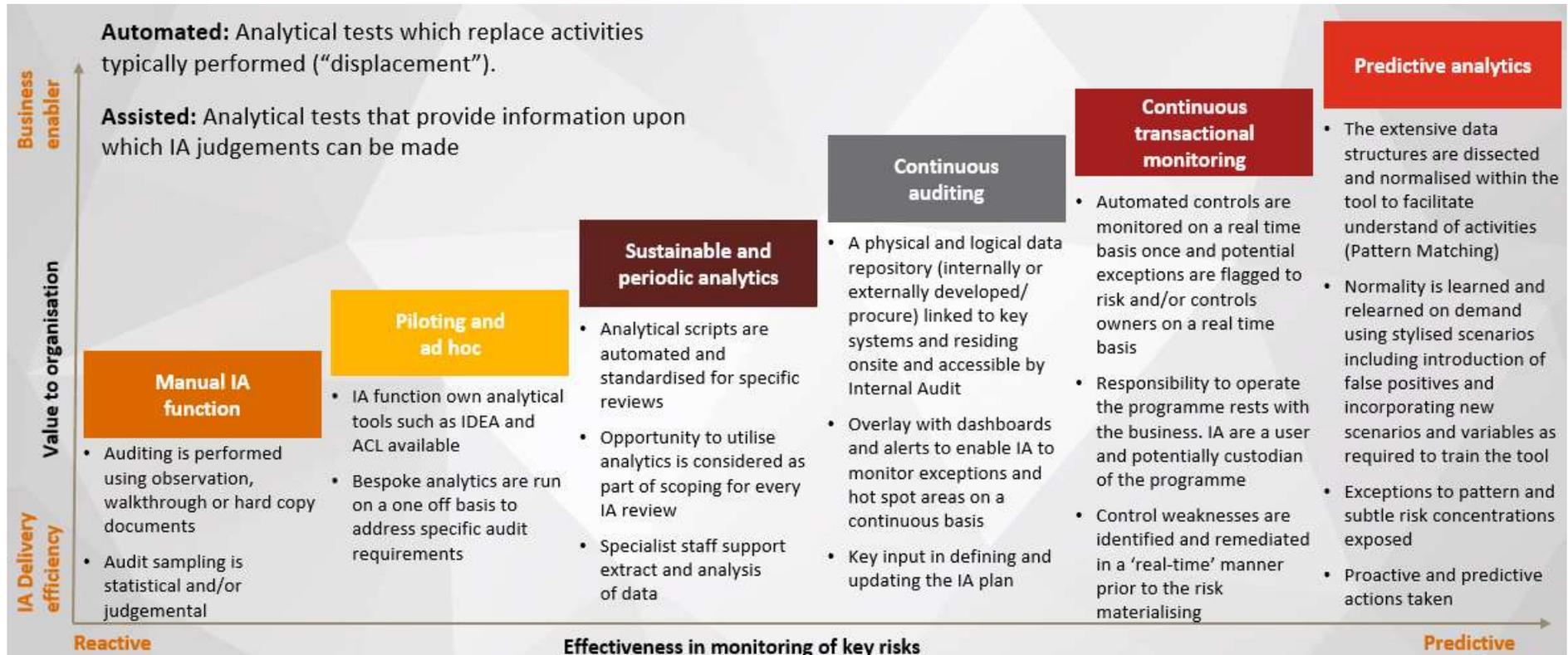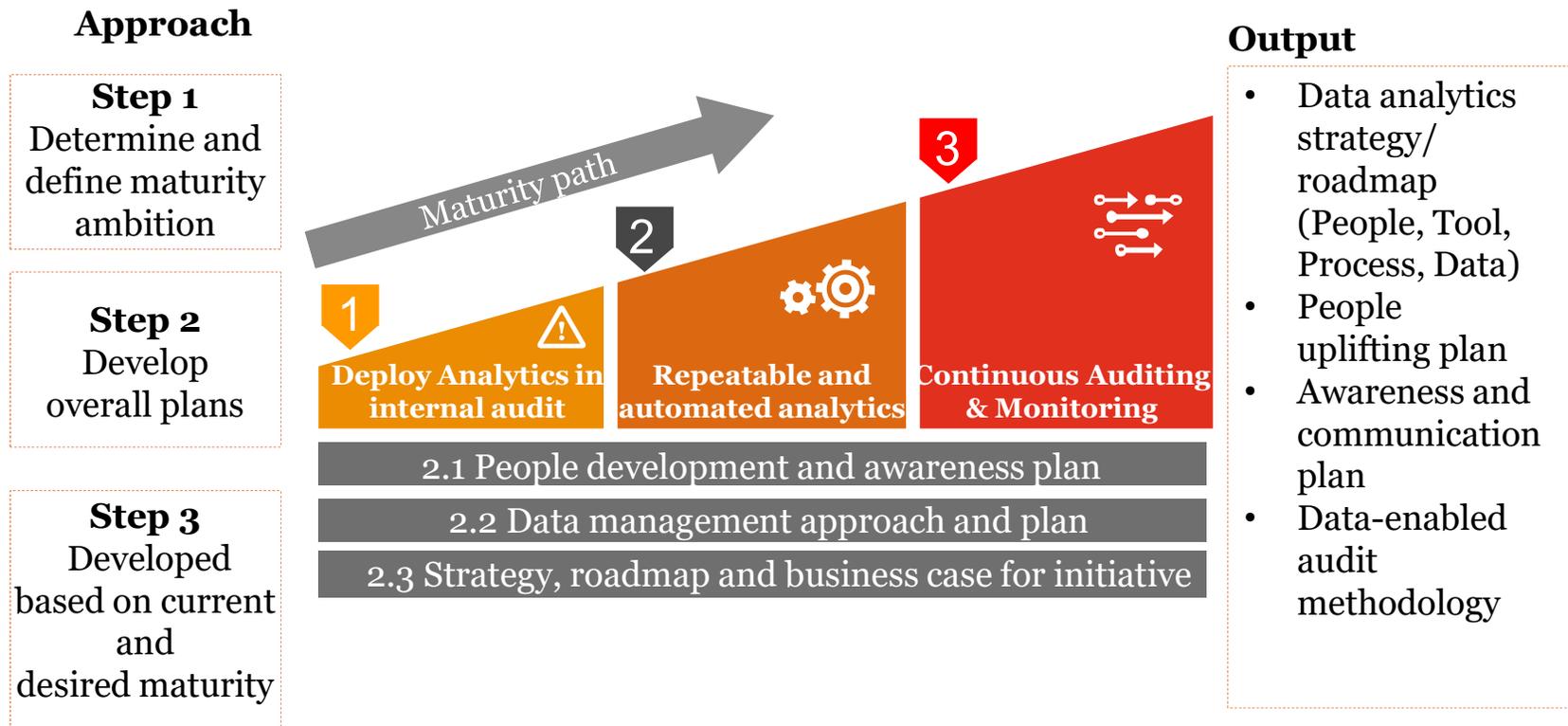## Better stakeholder engagement

Shorten the distance from insight to action by inviting business stakeholders to explore and visualise their own data in new ways.
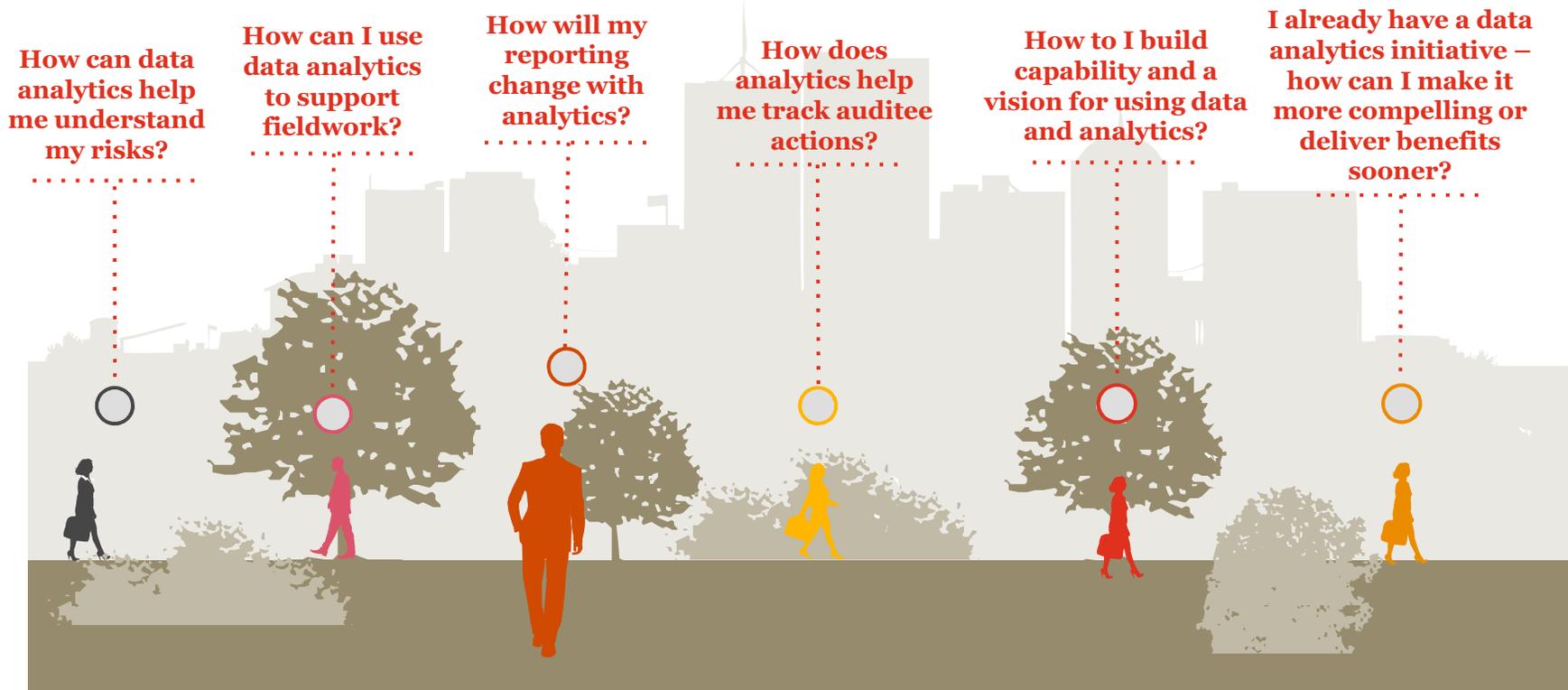
Effective use of data analytics is a journey

Automated: Analytical tests which replace activities typically performed ("displacement").

Assisted: Analytical tests that provide information upon which IA judgements can be made

Business enabler / **IA Delivery efficiency** (vertical axis: Value to organisation)

Effectiveness in monitoring of key risks (horizontal axis: Reactive → Predictive)

Manual IA function
- Auditing is performed using observation, walkthrough or hard copy documents
- Audit sampling is statistical and/or judgemental

Piloting and ad hoc
- IA function own analytical tools such as IDEA and ACL available
- Bespoke analytics are run on a one off basis to address specific audit requirements

Sustainable and periodic analytics
- Analytical scripts are automated and standardised for specific reviews
- Opportunity to utilise analytics is considered as part of scoping for every IA review
- Specialist staff support extract and analysis of data

Continuous auditing
- A physical and logical data repository (internally or externally developed/ procure) linked to key systems and residing onsite and accessible by Internal Audit
- Overlay with dashboards and alerts to enable IA to monitor exceptions and hot spot areas on a continuous basis
- Key input in defining and updating the IA plan

Continuous transactional monitoring
- Automated controls are monitored on a real time basis once and potential exceptions are flagged to risk and/or controls owners on a real time basis
- Responsibility to operate the programme rests with the business. IA are a user and potentially custodian of the programme
- Control weaknesses are identified and remediated in a 'real-time' manner prior to the risk materialising

Predictive analytics
- The extensive data structures are dissected and normalised within the tool to facilitate understand of activities (Pattern Matching)
- Normality is learned and relearned on demand using stylised scenarios including introduction of false positives and incorporating new scenarios and variables as required to train the tool
- Exceptions to pattern and subtle risk concentrations exposed
- Proactive and predictive actions taken

The journey towards continuous auditing and monitoring

Approach

Output

Step 1 Determine and define maturity ambition	
Step 2 Develop overall plans	
Step 3 Developed based on current and desired maturity	

Maturity path

1 **Deploy Analytics in internal audit** ⚠

2 **Repeatable and automated analytics**

3 **Continuous Auditing & Monitoring**

2.1 People development and awareness plan

2.2 Data management approach and plan

2.3 Strategy, roadmap and business case for initiative

- Data analytics strategy/ roadmap (People, Tool, Process, Data)
- People uplifting plan
- Awareness and communication plan
- Data-enabled audit methodology

Data and analytics in internal audit

What's on your mind?

How can data analytics help me understand my risks?

How can I use data analytics to support fieldwork?

How will my reporting change with analytics?

How does analytics help me track auditee actions?

How to I build capability and a vision for using data and analytics?

I already have a data analytics initiative – how can I make it more compelling or deliver benefits sooner?

Fully incorporating analytics to transforms and accelerates the audit process

04
- Report to Results using data analytics to show impact of issue and effect of recommendation
- Issues dashboard
- Compliance metrics

03
- Deep dive into high risk areas
- Surface review of low risk areas
- Data-driven testing
- 100% coverage
- Process, control, and results validation
- Root cause identification

Embedded and sustainable analytics

Reporting

Risk assessment

Fieldwork and execution

Audit planning

Continuous monitoring and auditing
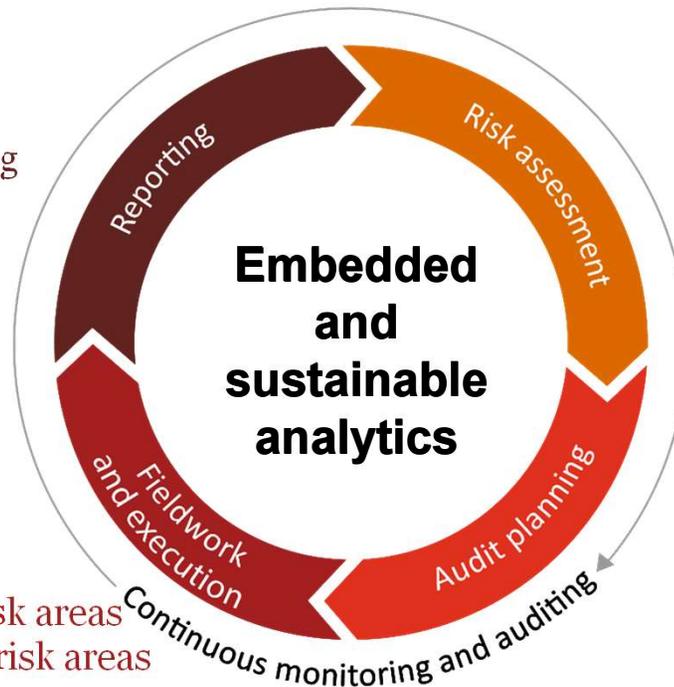
01
- Incorporate data to perform a targeted risk assessment
- Annual internal audit risk assessment
- Risk monitoring
- Business unit or site-level profiling

02
- Project-level risk assessment
- Audit pre-planning
- Risk attribute sampling
- Use data to Plan Audits to determine high risk areas to audit

PwC's data driven approach

Fuelled by your goals, and our experience, the possibilities are endless.

Technical Experts

+

Business insights

+

Tools and visualisation dashboards

=

Optimised business outcomes

- Better visibility to help drive strategic objectives
- Reduce risk in your organisation
- Business and IT effectiveness & efficiency

What is effective Data Analytics?

Manage data

Collecting, consolidating and cleaning relevant data.
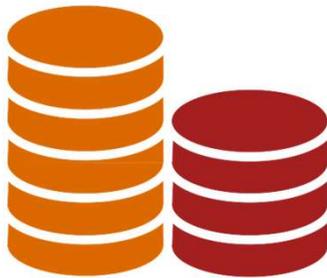
Increasing amounts of data from new and existing sources

Perform analytics

Applying intelligent techniques to uncover insight from the relevant data.

Predictive, descriptive and prescriptive analytics

Create visualisation

Converting the data into a more comprehensible and user-friendly format.

Data visualization tool

Harness insight

Applying the insight into more effective decision-making.
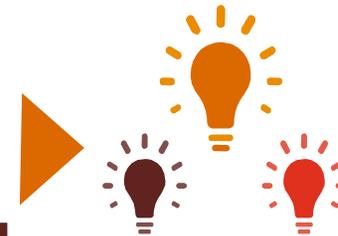
Improved risk, compliance, margins, productivity, growth and innovation

Underpinned by business expertise and experience

The foundation for data analytics in Internal Audit

Business Profiling and Audit Intelligence

Profiling business units and auditable entities using quantitative metrics

Risk Attribute Sampling

Identifying anomalies and patterns in high-risk transactions

Process and Control Validation

100% coverage / end-to-end testing

Data Testing

Testing completeness and integrity of data by integrating disparate data sources

Scenario Modeling

Complex modeling of processes using business requirements or independent sources

Presentation

Summarizing key issues to stakeholders and creating operationalized interfaces to review findings on a periodic basis

Sources of Data

Internal
- Information, facts and data available from within a company's information system

External
- Information that is found from outside the company, or from third parties

Structured

- Data that is identifiable because it is organised in a particular way
- Typically, data is structured as an array, hash table, linked list or stack

- **Transactional data**
- Sales, cost, inventory, payroll, and accounting
- **Operational data**
- Parts tracking, bank account info, customer details, ERP

- **Market data**
- Retail data, Macro-economic indicators (OPEC oil prices, inflation, etc.), Market surveys, etc
- **Third party reports**
- Equity research, Datamonitor

I | II
III | IV

Unstructured

- Data that has no identifiable structure
- Since documents can have its own structure based on the software used to create it, this is sometimes referred to as *"loosely structured data"*

Social media:

Text Data:

Multimedia:

Question to be answered

	Past	**Present**	**Future**
Information	What happened?	What is happening now?	What will happen?
Insight	How and why did it happen?	What's the next best action?	What's the best / worst that can happen?

Question to be answered

1	**2**	**3**	**4**	**5**
Descriptive	**Diagnostic**	**Explorative**	**Predictive**	**Prescriptive**
What happened?	*Why did it happen?*	*What might be interesting?*	*What is likely to happen?*	*What can we do about it?*
• Condense data into smaller, more useful pieces of information • Standard and ad-hoc reporting • Dashboards, mostly static • Query & drill down into details • Aim of most MI/BI activities	• Data analysis by employing predefined criteria • Rules based data analysis e.g. controls testing, suspicious transaction activity etc. • Essential to process rectification and improvement	• Manual (interactive dashboard) OR • Automated discovery (machine learning, e.g. clustering) • Non-rule based data discovery • Uncover underlying structure, patterns, anomalies	• Predictive modelling on historical data to produce future likelihood of events • Prediction, e.g. Random Forest, NN, Deep Learning, GBM etc. • Forecasting, e.g. statistical(smoothing/ trend/seasonality), advanced (Arima)	• Suggests the best option for handling a future scenario • Convergence of prior analytic activities • Optimisation under uncertainty • Close loop between analytics and process • Simulation e.g., (Monte Carlo, Markov Chains)

Predictive Analytics

Data Analytics Process

Understanding

- Who to involve?
- Core requirements and additional value

Data extraction & receipt

- How?
- PwC Extractor
- Independence
- Security concerns

Data preparation

- Why?
- How?

Data visualisation

- How?
- Tools
- Additional value

1 2 3 4 5 6 7 8 9

Planning/Scoping

- Scoping document
- Cost vs. value
- Due dates?
- Repeats?
- Steps?

Data request

- Document
- Keep extract logs
- Data security
- Other concerns

Data validation

- Avoid disaster!
- How?
- What?
- Questions back to client

Testing

- What?
- How?
- Tools

Reporting

- Target audience?
- Additional value

2. Data Analytics Tools

Data calculation tools / Data Relation tools

Excel
A spreadsheet program which allows one to enter numerical values or data into the rows or columns of a spreadsheet, and to use these numerical entries for such things as calculations, graphs, and statistical analysis.

ACL & IDEA
Data Analysis solutions are specifically designed to help risk and control groups, such as Audit, Risk, Compliance, IT or Financial Control professionals perform in-depth analysis of data.

Access
A database management system (DBMS) from Microsoft that combines the relational Database Engine with a graphical user interface and software-development tools.

SQL
The standard language for dealing with Relational Database
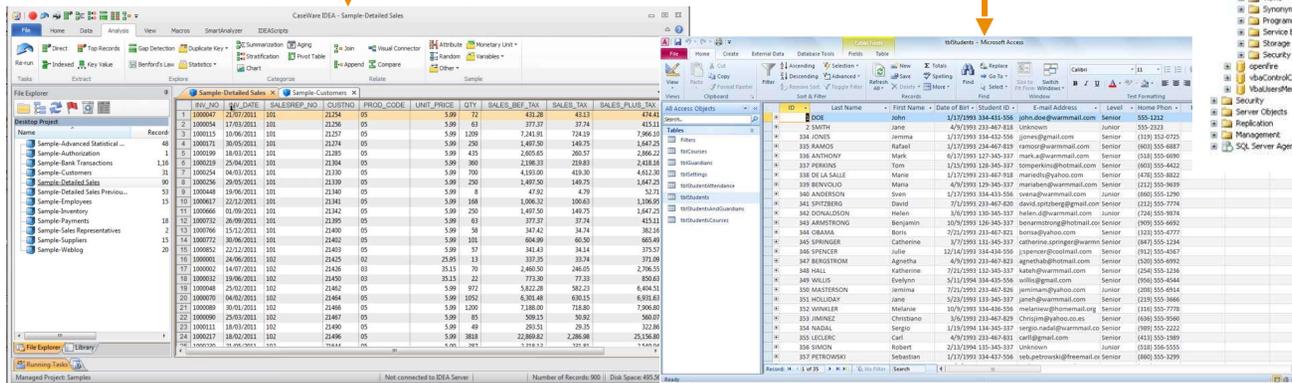
Data visualisation tools

Microsoft Power BI
A collection of online services and features that enables users to find and visualize data, share discoveries and collaborate
in intuitive ways.

Qlik View
A tool that supports the creation of visualizations that effectively organize, communicate and share analysis with clients. It offers more advanced functionality when compared with Tableau.

Tableau
A visualization tool that
supports the creation of
dashboards and interactive visualizations that we use
to effectively organize, communicate and share
analysis with clients.

TIBCO Spotfire
Analytics' software designed for data exploration. It enables users to discover and depict critical insights in data.

Other tools – Process Analytics tools

PwC uses Perceptive
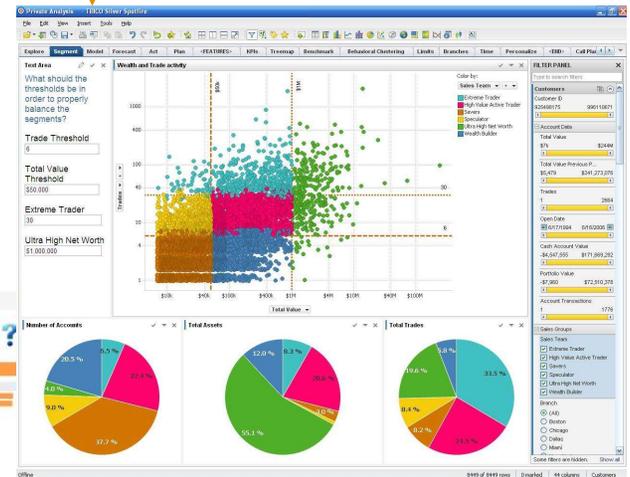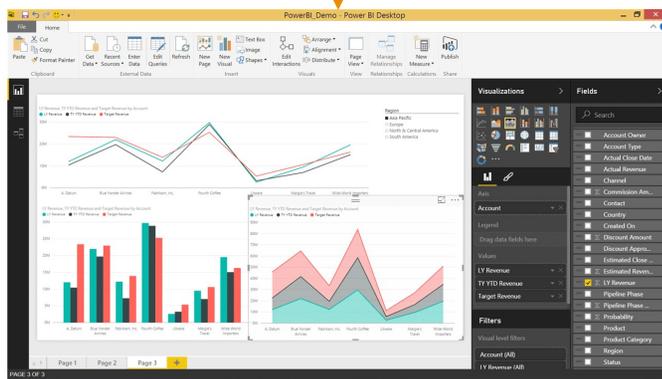
Top 5 software tools in the market	Functionality	Ease of use
• Perceptive (Lexmark)	◑	◑
• Disco (Fluxicon)	◔	◕
• Celonis (Celonis)	◑	◑
• PROM (open source)	●	◔
• Process Analyzer (QPR)	◔	◑

Other packages are:

- ARIS Process Performance Manager
- Comprehend
- Discovery Analyst
- Flow
- Futura Reflect
- Interstage Process Discovery
- OKT Process Mining Suite

- Rbminer/Dbminer
- Reflect One
- BeehiveZ
- Process Log Generator
- Apromore
- LoLa
- Process Discovery Focus

Other tools – Process Analytics tools

Perceptives: This tool allow you to define the events that you want Analytics to collect with event types. You then define dimensions to record data associated with the event. dimensions to record data such as the user id, application name, login time, location data, and so on. Then you may use such information for analytics.
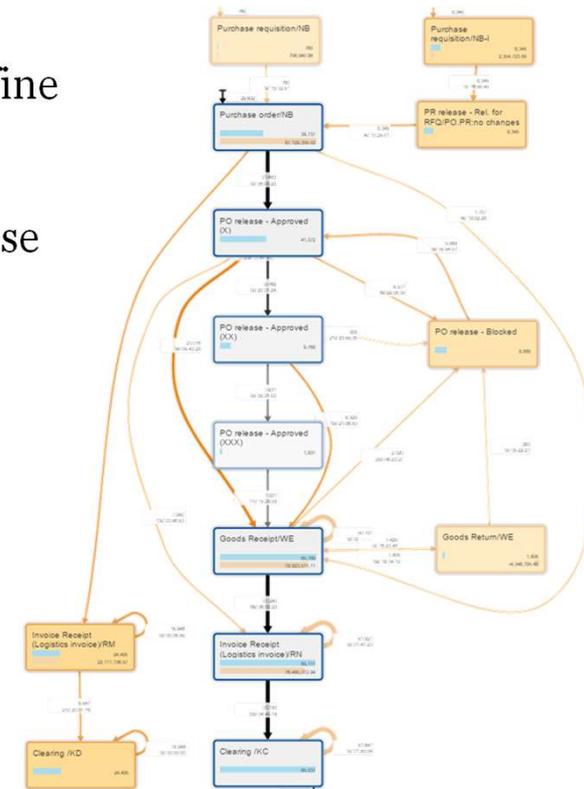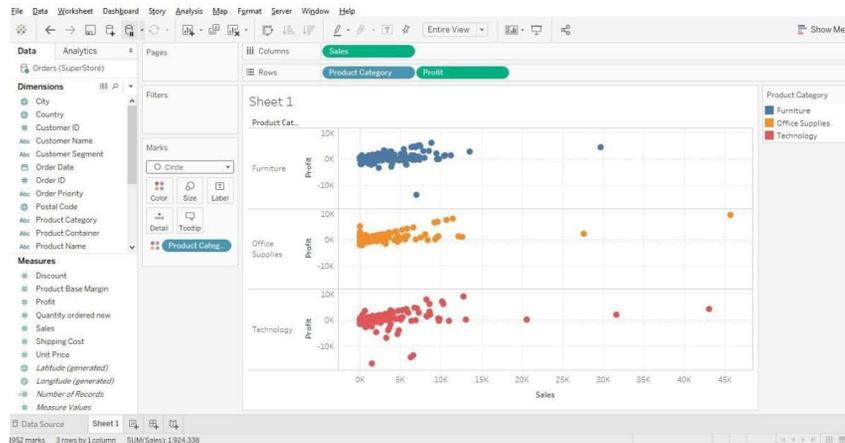
Other tools – ML and AI

R and Python: The languages of choice amongst the data science community. Free, open source and continually evolving, R and Python combine flexibility with access to the latest analytical, big data and visualization technologies.

3. Example of Data Analytics

4. Barriers to Success

Challenges

Little support by senior management

Limited resources

Poor quality of information

Lack of clarity around organisational strategies

Consistent information types and values

Little integration between systems

Cultural challenges

Large number of diverse business needs

Low success rates of previous technology projects
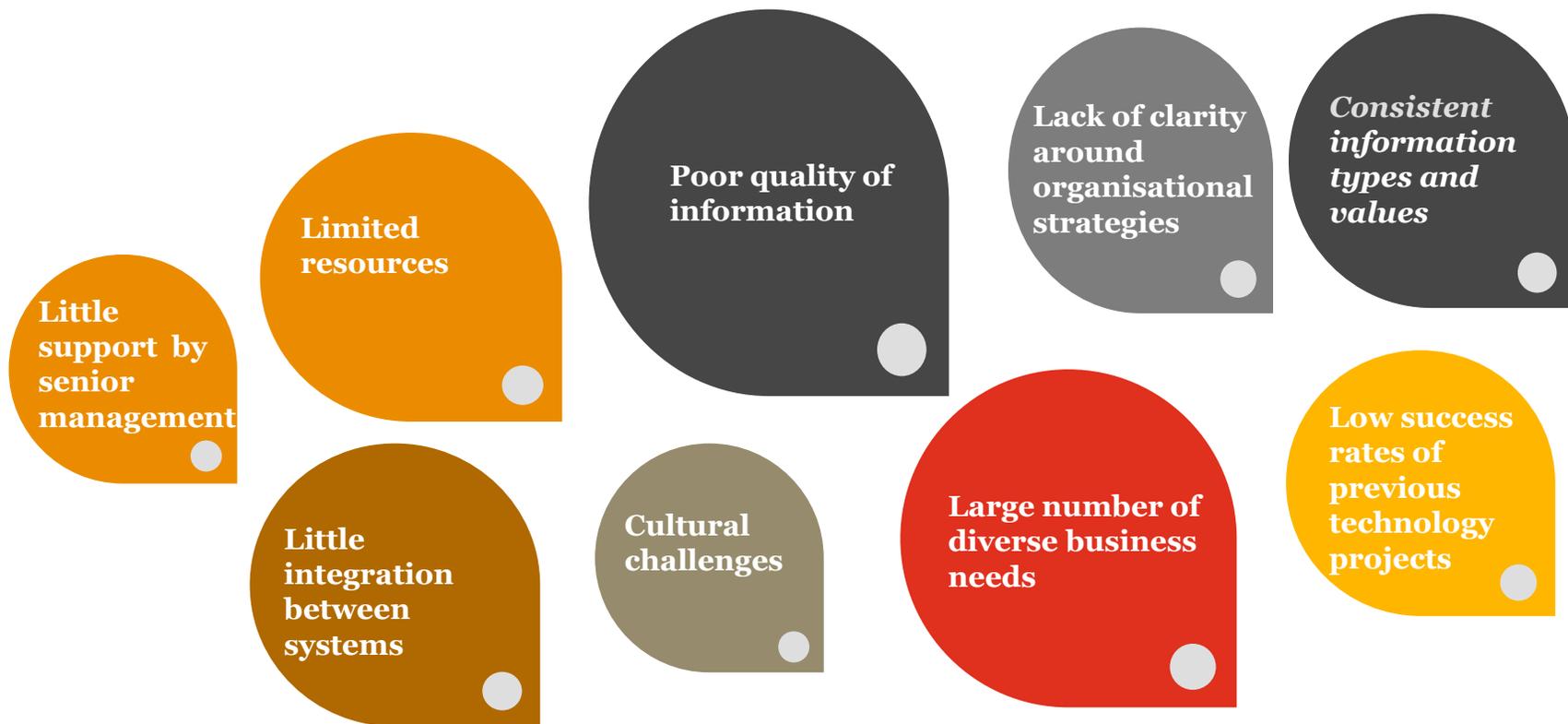
Barriers to Success: Avoiding the Pitfalls
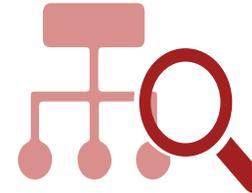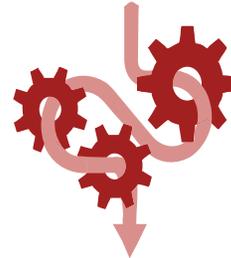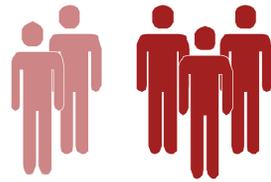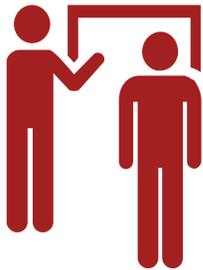
1 — Embarking on the journey without a defined strategy or in isolation

2 — Going it alone

3 — Isolating the analytics Team

4 — Falling into the automation trap

5 — Seeing analytics as just a bolt-on to existing audit procedures

6 — Underestimating the power of organizational culture

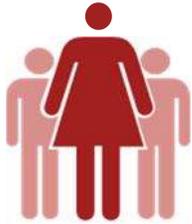# Embarking on the journey without a defined strategy or in isolation
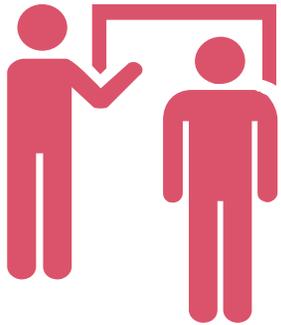
The barrier:

- Beginning an analytics function without a fully defined strategy or plan
- Not positioning analytics as a serious initiative that warrants funding or support
- Failure to leverage connection points (such as IT, compliance, or operations)

What to do:

- Formalize or review your strategy, inclusive of the components to the right

- Establish realistic milestones and align your activities on a roadmap

- Combine resources and knowledge across teams and departments

- Establish a communication plan, and assess progress against success criteria

Strategy Elements diagram: Methodology, People, Data, Technology, Capabilities, Communication, Business Value

Going it alone

The barrier:

- Beginning an analytics function without a fully defined strategy or plan
- Not positioning analytics as a serious initiative that warrants funding or support
- Failure to leverage connection points (such as IT, compliance, or operations

What to do:

- Early execute the internal audit strategy
- Circulate the data analytics strategy with senior leadership
- Seek input from others in the organization who regularly apply data analytics, and then adjust the plan based on their experience

Connection
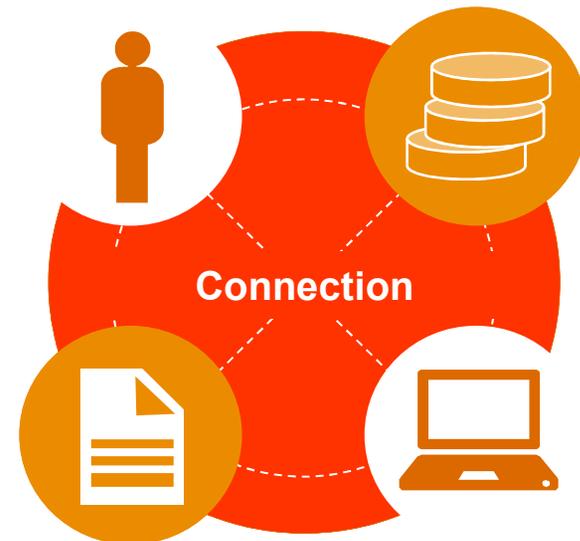
# Positioning the analytics team members in an isolated manner
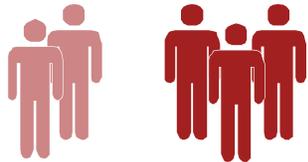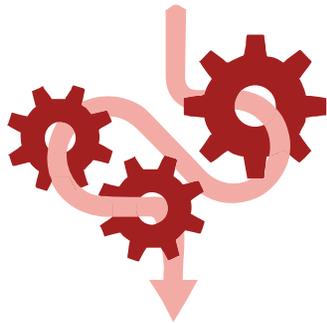
The barrier:

- Separating the analytics team from the traditional auditor team members
- Creating an analytics delivery center
- Discouraging technical analytics resources from engaging with the broader team, which prevents transfer of comp...

What to do:

- Establish analytics mindset and acumen as an expectation for all team members

- Raise the analytics IQ of everyone on the team

- Team analytics specialists with analysts staffed on audits for delivery

- Define clear roles and responsibilities for each team members

Audit knowledge

Analytic mindset and application

Business knowledge

Data and technical competency
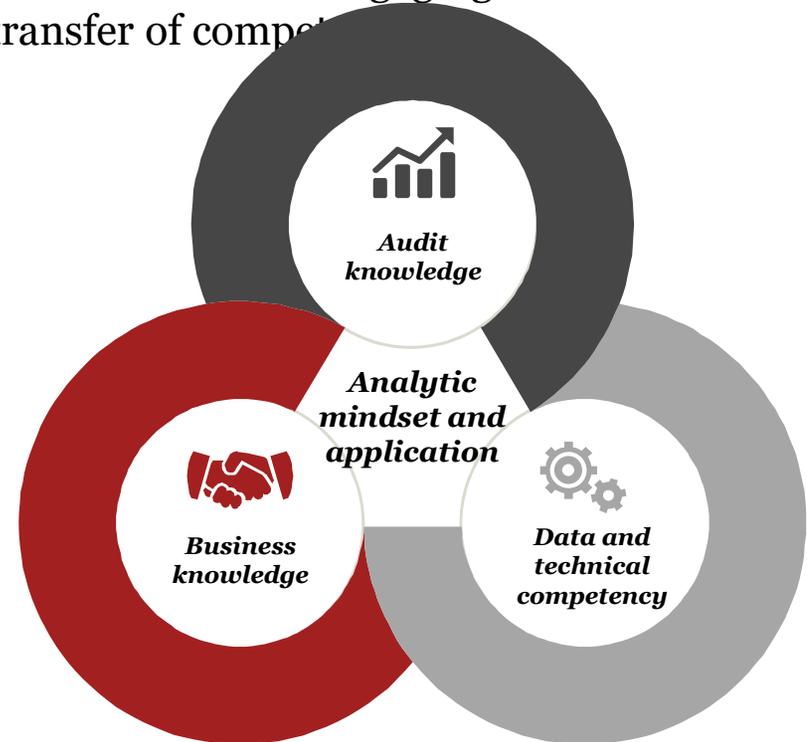
Falling into the automation trap

The barrier:

- Focusing only on audit efficiency through automating fieldwork or workprograms
- Limiting use of analytics to a traditional CAAT capacity
- Prohibiting the team from exploring data through profiling or allowing creativity to identify additional risk areas within an audit plan
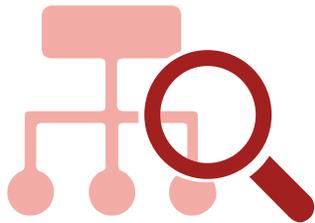
What to do:

- Focus on analytics as a catalyst for audit transformation

- Identify audits to pilot using analytics throughout the audit life cycle from planning to reporting

- Develop an analytics methodology that enables you to align resources to areas of risk, based on results of a risk assessment or data profiling

Data discovery enables ability to ask questions beyond risk areas within the workprogram

Analysis techniques beyond automation
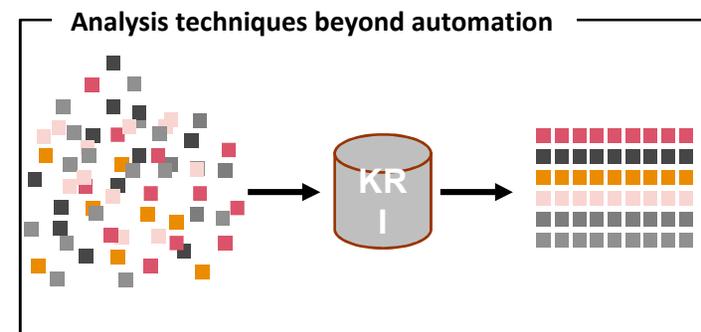
Seeing analytics as just a bolt-on to existing procedures

The barrier:

- Analytics that are not embedded within the audit methodology
- Not modifying the analytics methodology to standardize processes for using results of analytics

What to do:

- Revisit and modify your end-to-end audit methodology

- Standardize the analytics-enabled audit methodology and train end users on the process

- Gain momentum through pilot audits

01
Risk assessment
- Enterprise risk management
- Annual internal audit risk assessment
- Risk monitoring
- Business unit or site-level profiling

04
Reporting
- Audit and executive reports
- Issues dashboard
- Compliance metrics
- Analytics validation review

Embedded and sustainable analytics

02
Audit planning
- Project-level risk assessment
- Audit pre-planning
- Audit scoping and planning
- Risk attribute sampling

03
Fieldwork and execution
- Multi-unit auditing
- Data-driven testing
- 100% coverage
- Root cause identification

Underestimating the power of organizational culture

The barrier:

- Overlooking people and organizational change management
- Not considering the impacts that a modified analytics-enabled audit approach has on every aspect of the department (from resource scheduling to documentation)

What to do:

- Consider the impact of your unique corporate culture on your data analytics strategy and roadmap

- Find incentives to motivate employees to change

- Create a safe environment for learning, wherein people feel empowered and unafraid to ask questions or try something different
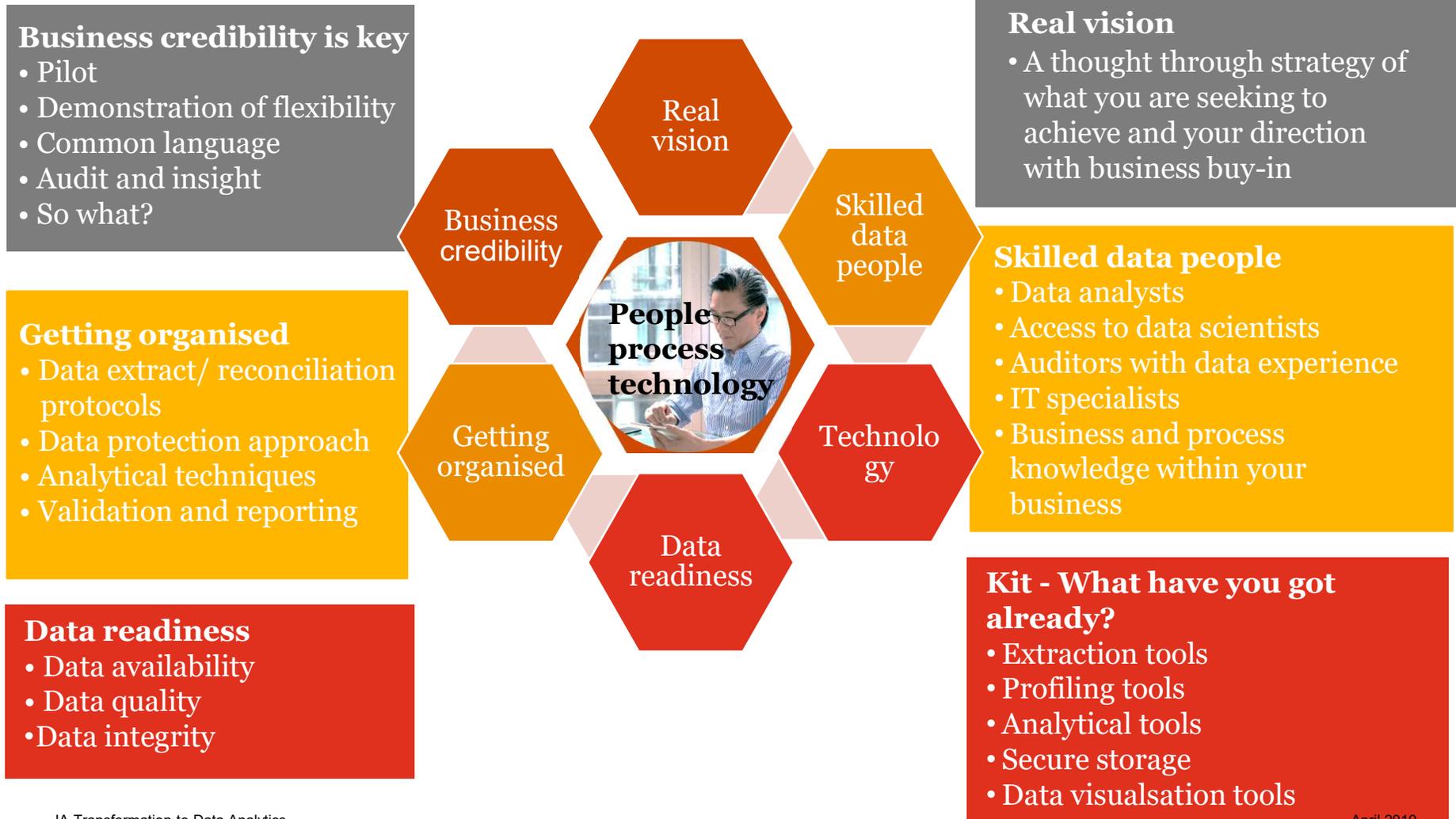
Communication

Incentives and recognition

Value, career path and growth

Culture trumps strategy

Building data analytics capability

Business credibility is key
- Pilot
- Demonstration of flexibility
- Common language
- Audit and insight
- So what?

Getting organised
- Data extract/ reconciliation protocols
- Data protection approach
- Analytical techniques
- Validation and reporting

Data readiness
- Data availability
- Data quality
- Data integrity

Real vision
- A thought through strategy of what you are seeking to achieve and your direction with business buy-in

Skilled data people
- Data analysts
- Access to data scientists
- Auditors with data experience
- IT specialists
- Business and process knowledge within your business

Kit - What have you got already?
- Extraction tools
- Profiling tools
- Analytical tools
- Secure storage
- Data visualsation tools

Real vision

Business credibility

Skilled data people

People process technology

Getting organised

Technology

Data readiness

Thank you

Please contact us for further information

Rinrat Pasavekin

Director, Risk Assurance

Email: rinrat.pasavekin@pwc.com

Tel: 02-844-1029

pwc.com