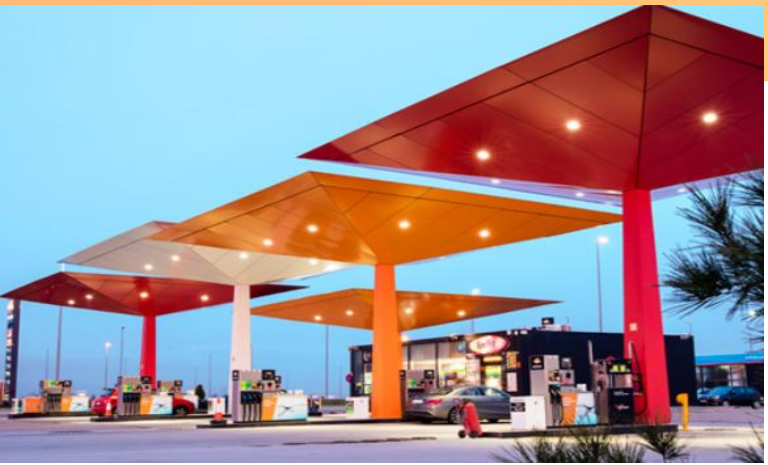
DATA ANALYTICS IN AUDIT
“Audit Analytics como Agente de Mudança”



SPEAKER

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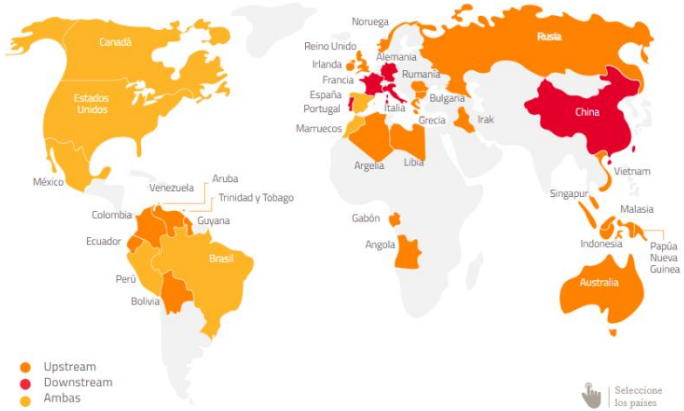
BSc & Master in Mathematics specialized in Computer Science - Universidad Complutense de Madrid (U.C.M.).

CISA
Certified Information Systems Auditor
An ISACA Certification

CRISC
Certified in Risk and Information Systems Control
An ISACA Certification



AGENDA

1. What is Audit Data analytics?
2. Why is it necessary in audit departments?
3. Audit analytics tools and techniques
4. How to transform an audit area
5. conclusion

AUDIT ANALYTICS

1

WHAT IS AUDIT DATA ANALYTICS?

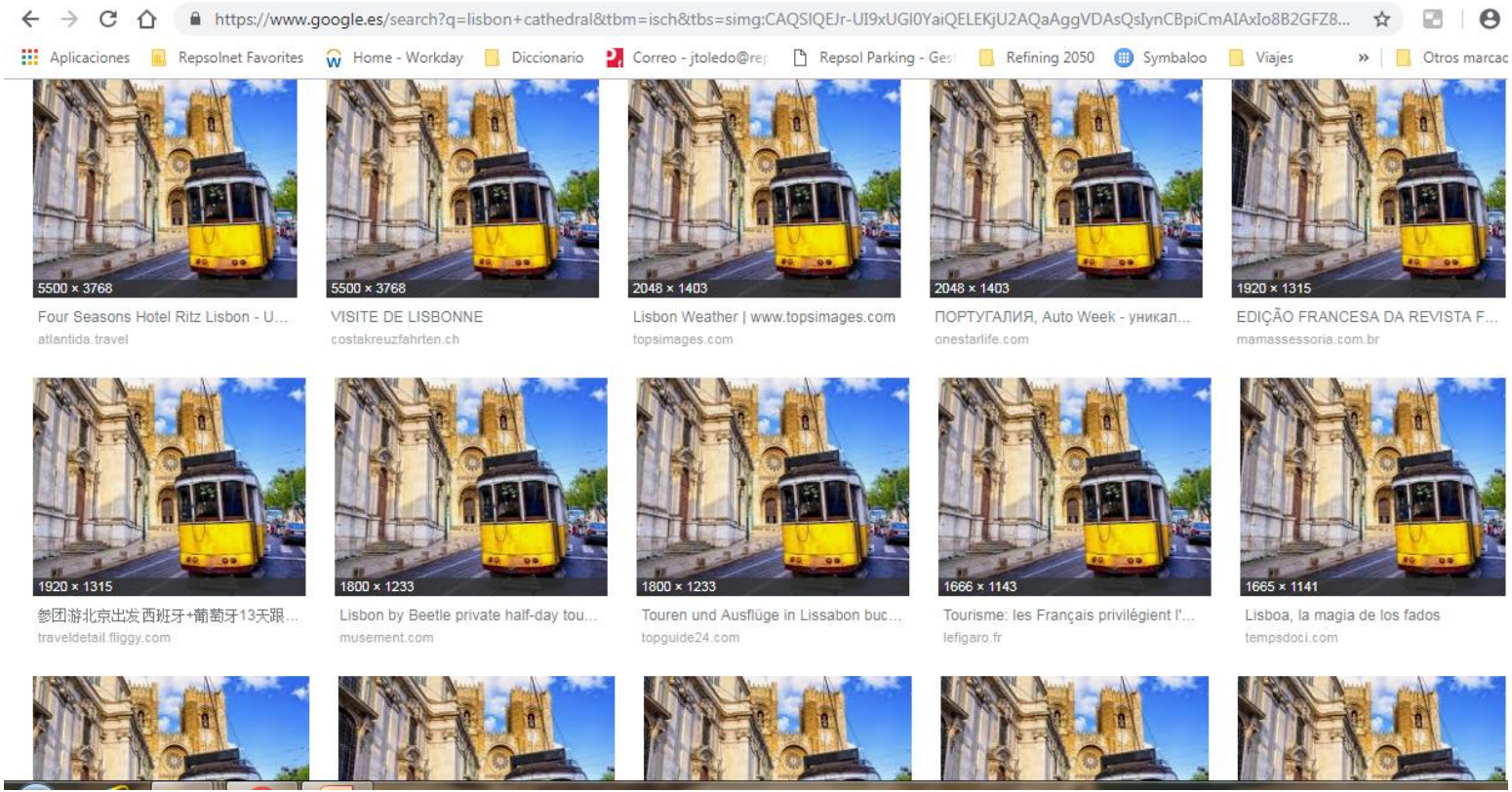
“The science and art of discovering and **analyzing patterns**, **identifying anomalies** and **extracting other useful information** in data underlying or related to the subject matter of an audit through **analysis, modeling and visualization** for the purpose of **planning or performing** the audit.”

AICPA - Association of International Certified Professional Accountants

WHY IS NECESSARY? VALUE AND BENEFITS

2

Has anything changed?



DIGITALIZATION IS CHANGING THE WORLD

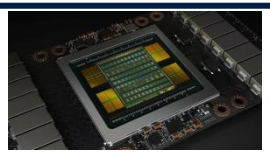
Source: social media. Oc.t 2018

CHANGES RELEVANT TO DO ANALYTICS

AUTOMATED BUSINESS PROCESSES

MORE USE OF I.T. SYSTEMS

NEW D.A.TOOLS



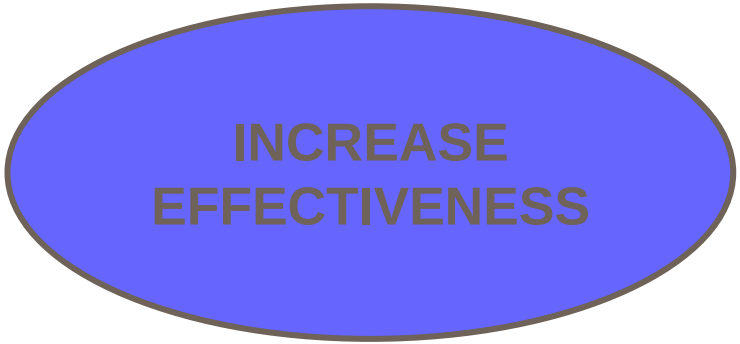
MORE POWERFUL COMPUTERS

DIGITALIZATION

ROBOTICS – RPA

IOT / IIOT

VALUE AND BENEFITS

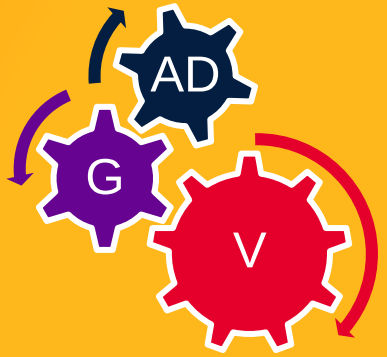


- Increase coverage of Audit universe
- Increase quality of Audit findings
- Repeatable processes

- Focus on areas of particular strategic need
- More dynamic reports

AUDIT ANALYTICS TOOLS AND TECHNIQUES

3



AUDIT ANALYTICS TOOLS AND TECHNIQUES

TOOLS

THERE ARE A VARIETY OF TOOLS TO FACILITATE DATA ANALYSIS

VISUALIZATION, DATA ANALYSIS & PROCESSING, ADVANCED ANALYTICS TOOLS…

TECHNIQUES

FROM VERY SIMPLE TO VERY ADVANCED

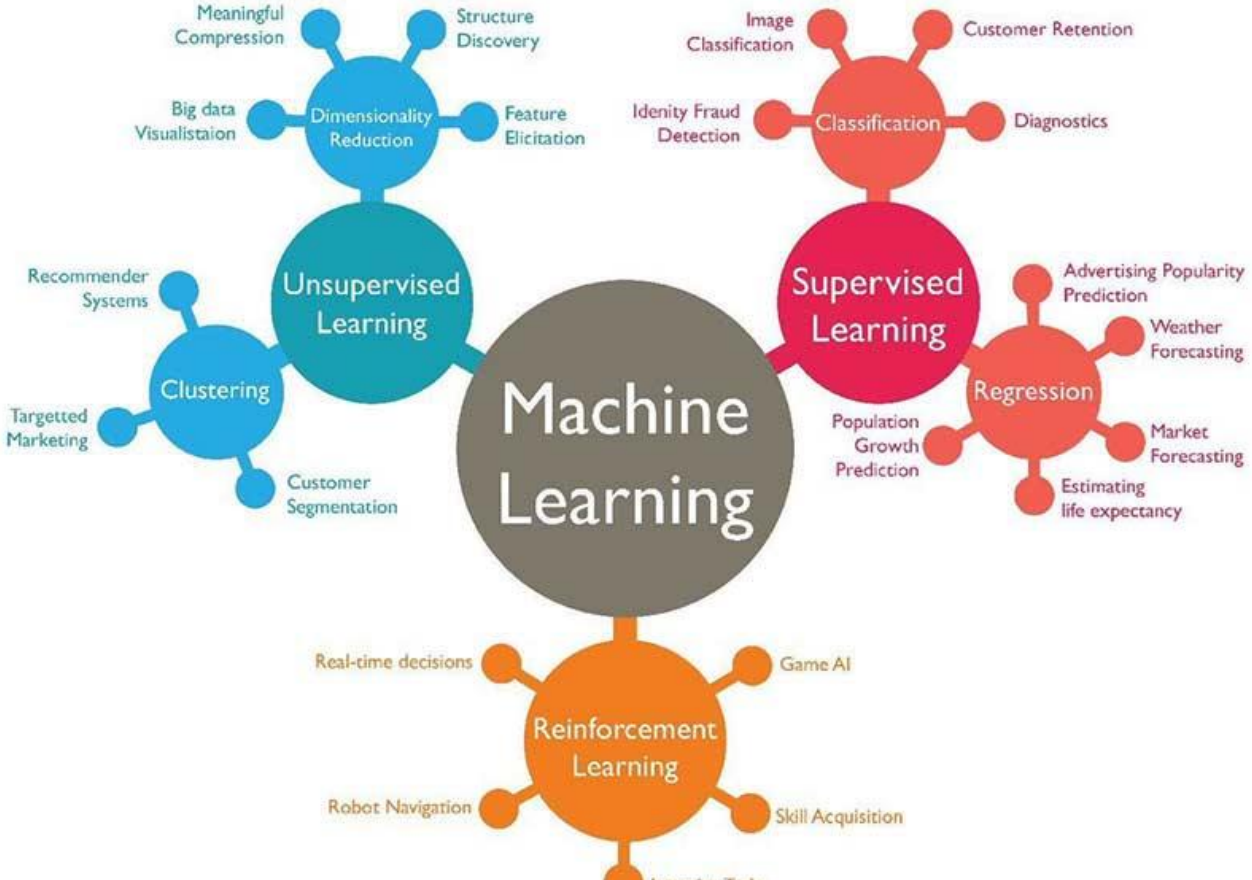
FIND A RECORD, COMBINE DATA OF DIFFERENT SOURCES, USE FUNCTIONS, BENFORD, CLUSTERING TECHNIQUES, ARTIFICAL NEURAL NETWORKS

EXAMPLE OF TECHNIQUES

FILTER & VIEW	Find a register, detect missing records, summarize,..
COMBINE DATA	Combine data from different tables or sources.
CONTINUOUS MONITORING	Apply rules to automated periodic evaluations of risks and controls, using a larger proportion of transactions
ADVANCED FUCNTIONS	Correlation analysis, Fuzzy Joins, Benford Law,
ADVANCED ALGORITHMS	Machine Learning Algorithms, Clustering, SVM, Artificial Neural Networks (ANN).

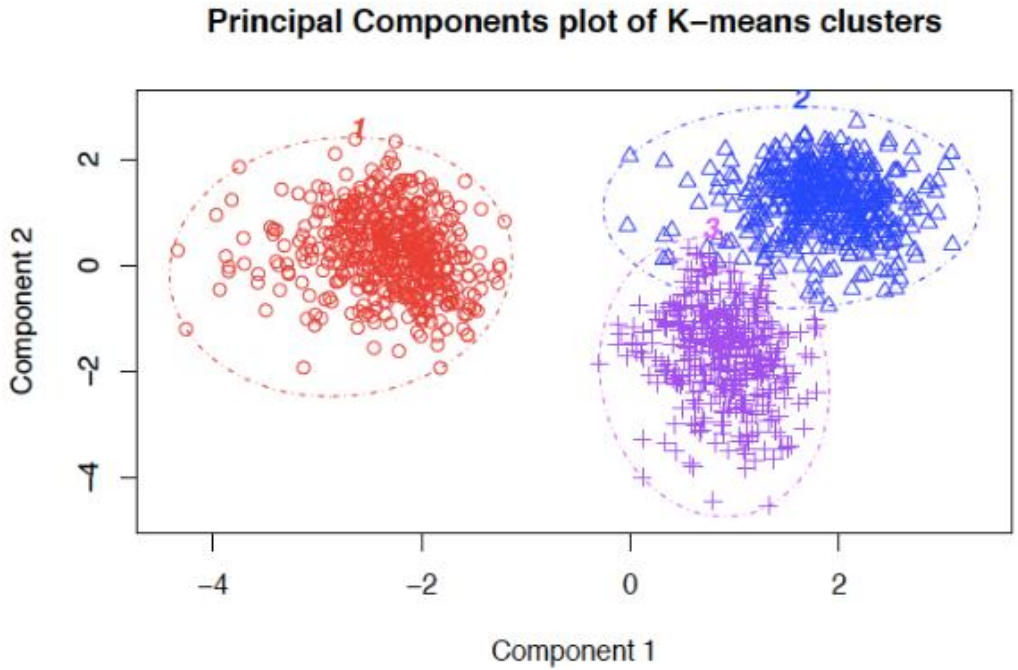
AUDIT ANALYTICS TOOLS AND TECHNIQUES

SUPERVISED AND UNSUPERVISED MACHINE LEARNING



AUDIT ANALYTICS TOOLS AND TECHNIQUES

CLUSTERING



Source: columbia.edu

TOOLS

VISUALIZATION

Qlik

SAP Business Objects

Power BI

tableau

Spotfire TIBCO Software

DATA PROCESSING AND ANALYSIS

IDEA Software para análisis de datos

acl

ADVANCED ANALYSIS

IBM SPSS MODELER

SAS

R

Could ML TensorFlow Tasks

EXTRACTION TOOLS

SAP

SQL

DATA PREPARATION AND CLEANING

python

OCR

CONTINUOUS MONITORING

SACI

SAP GRC

*Examples for illustrative purposes.

AUDIT ANALYTICS TOOLS AND TECHNIQUES
VISUALIZATION

Predicted fleet health - overview

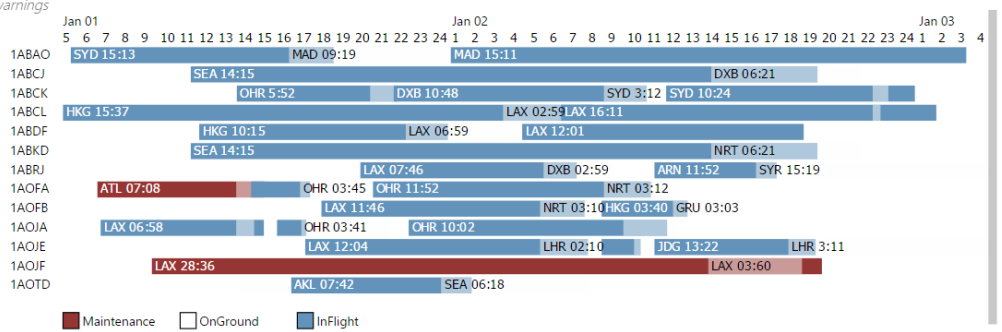
Issue details

Tail Number	Type	MessageSummary	Part reference
1AOTD	Recommendation	Fuel consumption increase predicted, engine wash ...	3620
1AOJF	Anomaly	Significant engine second stage pressure anomaly.	3840
1AOJE	ML model forecast	Bleed air anomaly prediction.	7390
1AOJA	Maintenance message	Maintenance Message combination suggests signif...	2784
1AOFB	Recommendation	Fuel consumption increase predicted, engine wash ...	3620
1AOFA	Anomaly	Significant engine second stage pressure anomaly.	3840
1ABYF	Maintenance message	Maintenance Message combination suggests signif...	2784
1ABYE	Recommendation	Fuel consumption increase predicted, engine wash ...	3620
1ABYD	Anomaly	Significant engine second stage pressure anomaly.	3840
1ABYC	Maintenance message	Maintenance Message combination suggests signif...	2784
1ABYB	Recommendation	Fuel consumption increase predicted, engine wash ...	3620
1ABYA	Anomaly	Significant engine second stage pressure anomaly.	3840

Current location or next destination

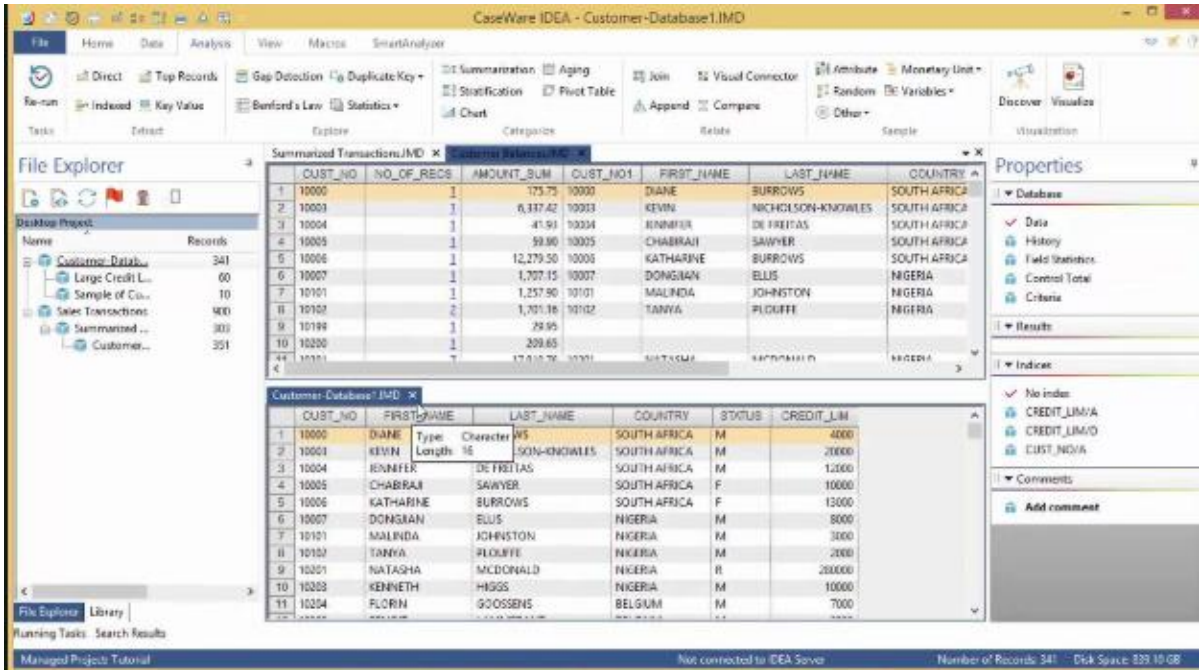
Click on any aircraft to see its location and warnings

Flight schedule



AUDIT ANALYTICS TOOLS AND TECHNIQUES

DATA PROCESSING AND ANALYSIS (CAATS)



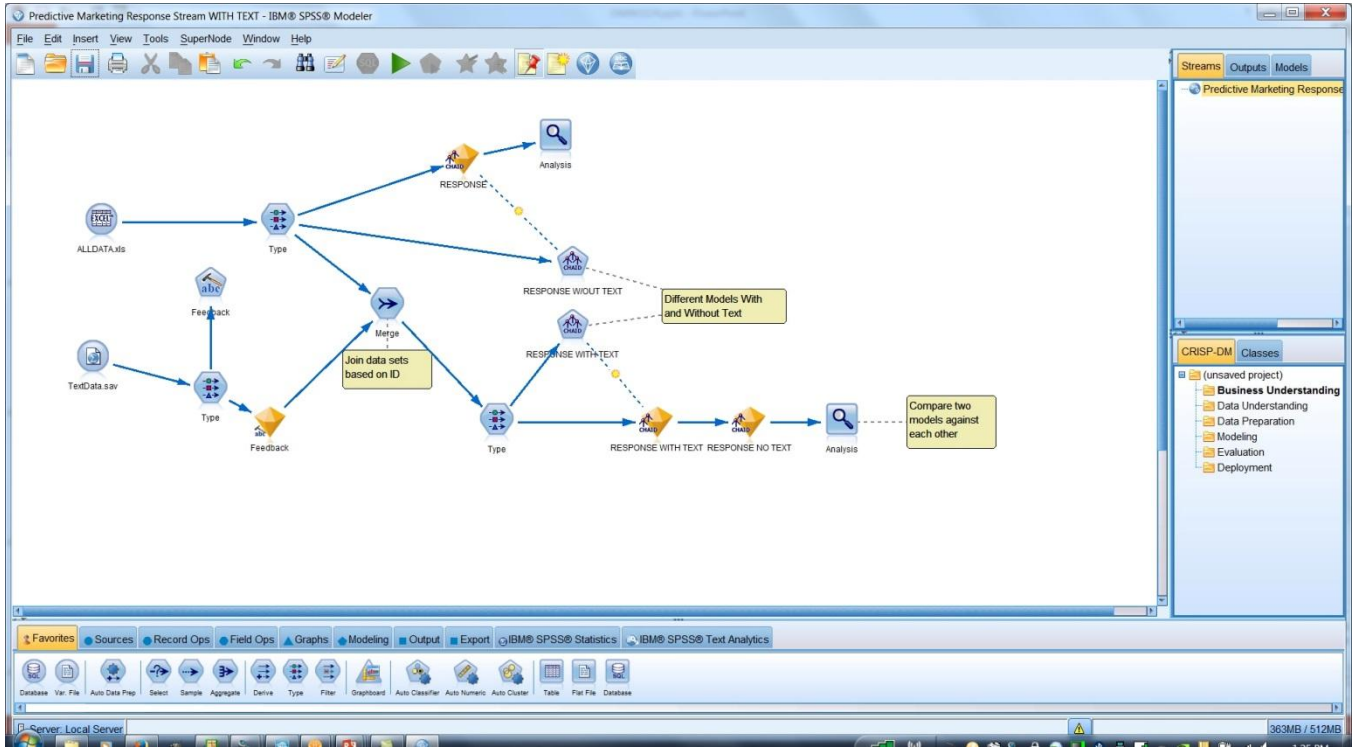
Easy

MERGE TABLES AND SEARCH RECORDS

AUDIT TRAIL

AUDIT ANALYTICS TOOLS AND TECHNIQUES

ADVANCED TOOLS



How to transform an Audit area

4

REPSOL EXPERIENCE IN AUDIT DATA ANALYTICS

1. CONTINUOUS MONITORING
2. AUDIT PROJECTS ADVANCED ANALYTICS EXAMPLES
3. TRANSFORMATION PLAN

1

CONTINUOUS AUDIT
MONITORING PROCESS

Program execution → **Identification Issues** → **Communication and follow up**

SAP system 1

SAP system 2

SAP system n

Other Non SAP system

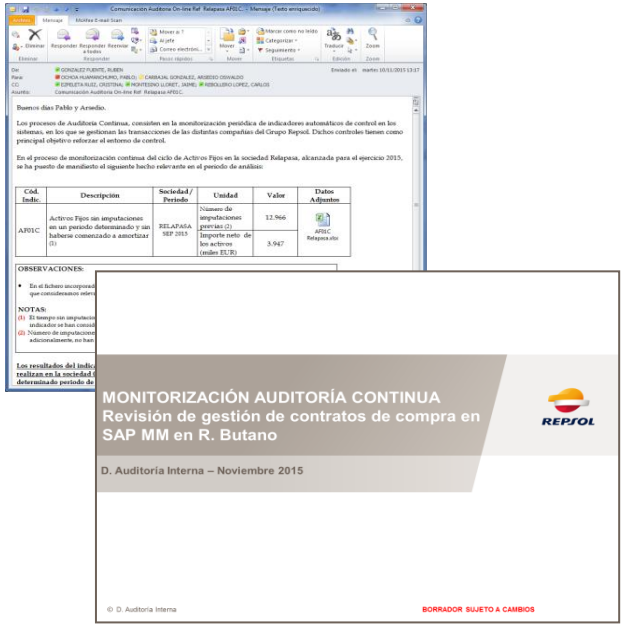
Controls:
- **Continuous monitoring**
- **Projects**

Continuous Audit SAP console

Dashboard

Sociedad Cabecera	Adquisiciones	Ingresos	Activos fijos
PETROLEOS DEL NORTE, S.A.			
R. YPF ORIENTE MEDIO(SUC)			
R.INTERNATIONAL FINANCE			
RCPP			
REFINERIA LA PAMPILLA,S.A			
REPSOL BUTANO, S.A.			
REPSOL COMERC. DE GAS S.A			
REPSOL DIRECTO S.A			
REPSOL E&P SUCURSAL PERÚ			
REPSOL E&P T&T LTD			
REPSOL E&P USA INC			

Results Panel



2

EXAMPLES CONTINUOUS AUDIT

EXAMPLE OF TYPES OF ISSUES THAT WE CAN DETECT

- Unauthorized purchases
- Critical segregation of duties conflicts in purchasing process
- Modifications in credit risk limits by unauthorized users
- Duplicate payments
- Identification and revocation of unauthorized or improper powers of attorney.
- Cybersecurity – Antivirus . SAP Controls. Users with Critical Transactions.
- Systems Development Life Cycle. Changes with approvals.

2

EXAMPLES

SOME EXAMPLE OF PROJECTS & TECHNIQUES

Employee corporate credit card expenses	• Data clustering • Benford's Law analysis
Corporate card for purchasing fuel	• Data blending • Scoring of transactions
Maintenance expense report	• Data profiling • Reconciliation
Shadow IT	• Artificial Neural Network • Data Filtering

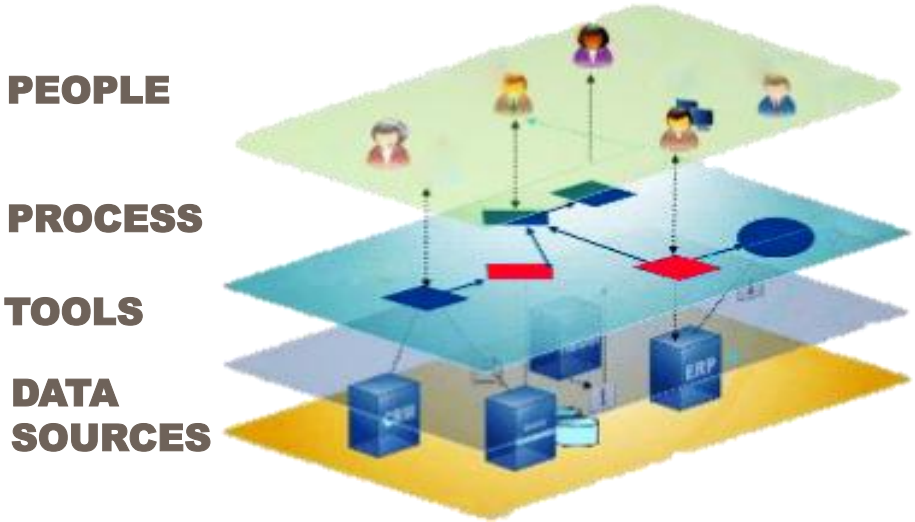
REPSOL EXPERIENCE IN AUDIT DATA ANALYTICS

3

TRANSFORMATION PLAN

DATA ANALYTICS AUDIT TRANSFORMATION

Lines of work



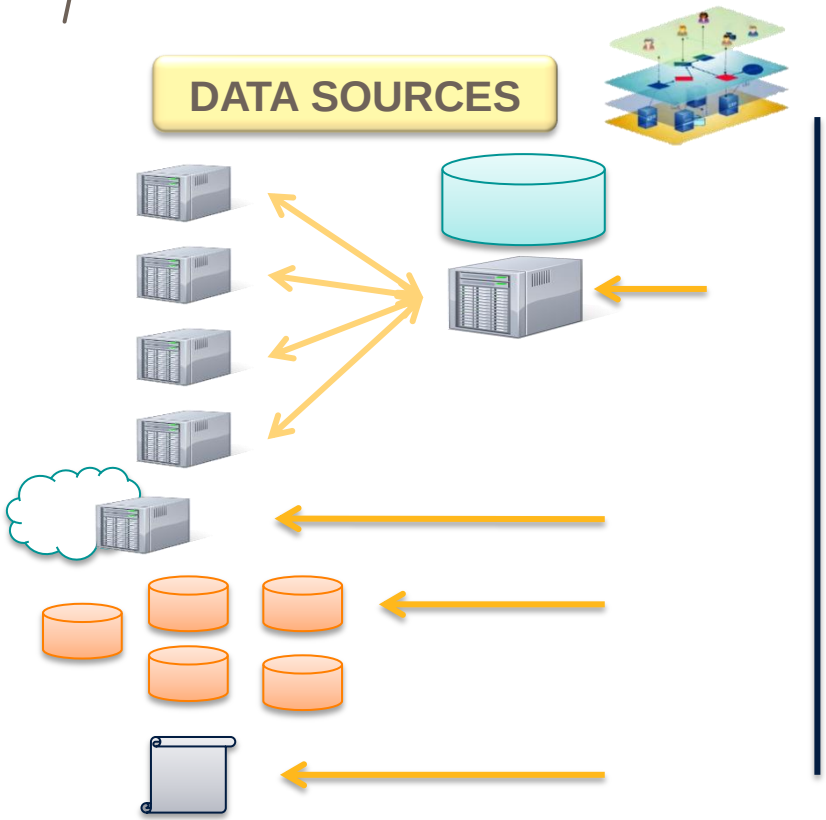
PEOPLE
(knowledge/skills)

AUDIT PROCESSES
(Plan, Fieldwork, Reporting)

TOOLS
(data extraction, visualization, transformation, mass analysis, advanced techniques)

DATA SOURCES
(identify current and future data sources, e.g. SAP, data lake, cloud,...)

DATA ANALYTICS AUDIT TRANSFORMATION



- ✓ Identify Databases. Don’t forget Cloud Computing.
- ✓ Align the plan with the IT plan
- ✓ Connect with Data Lake and DW
- ✓ Define tools to facilite the download the data
- ✓ Establish rules for approvals and privacy

DATA ANALYTICS AUDIT TRANSFORMATION

TOOLS

1

Define tools for each DA requirement

2

Align tools with IT & Digitalization Strategy

3

Reevaluate periodically the tools needed.

DATA ANALYTICS AUDIT TRANSFORMATION

AUDIT PROCESSES

PLANNING
- GLOBAL AUDIT PLAN
- AUDIT SCOPE.

FIELD WORK
- HYPOTHESIS
- ANALYTICS TESTS

REPORTING
DYNAMIC REPORTS

FOLLOW UP
RECOM. REPORTS

DATA ANALYTICS AUDIT TRANSFORMATION

PEOPLE (1)

Define INTERNAL vs EXTERNAL resources strategy

Define COMPENTENCES needed

Do an ASSESSMENT of the compentences

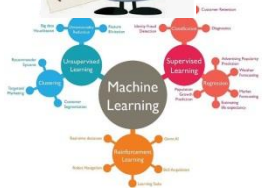
Identify different PROFILES

Establish a TRAINING PROGRAM

DATA ANALYTICS AUDIT TRANSFORMATION

PEOPLE (2)

Auditors & Managers	Data Analyst	Data Scientist



Power BI

IDEA
Software para análisis de datos

SAP

IBM SPSS MODELER

SQL

python

CONCLUSION

5

CONCLUSIONS

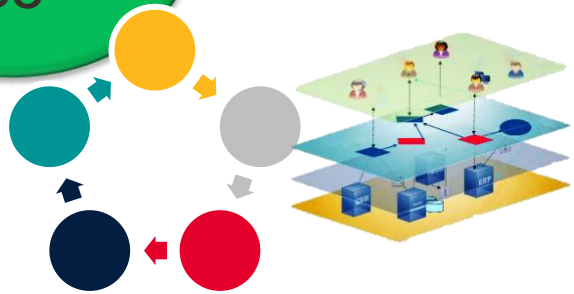
SPONSOR

CONNECT WITH I.T AND BUSINESS

D.A. FOR ALL AUDITORS

CHANGE OF MINDSET

MEASURE PLAN DO



Q&A

“VISUALIZE WHERE YOU WANT TO BE …AND DO IT”

THANK YOU