

Continuous Assurance and Audit Data Analytics

Miklos A. Vasarhelyi, Rutgers Business School

37WCARS

Gold Coast, Australia

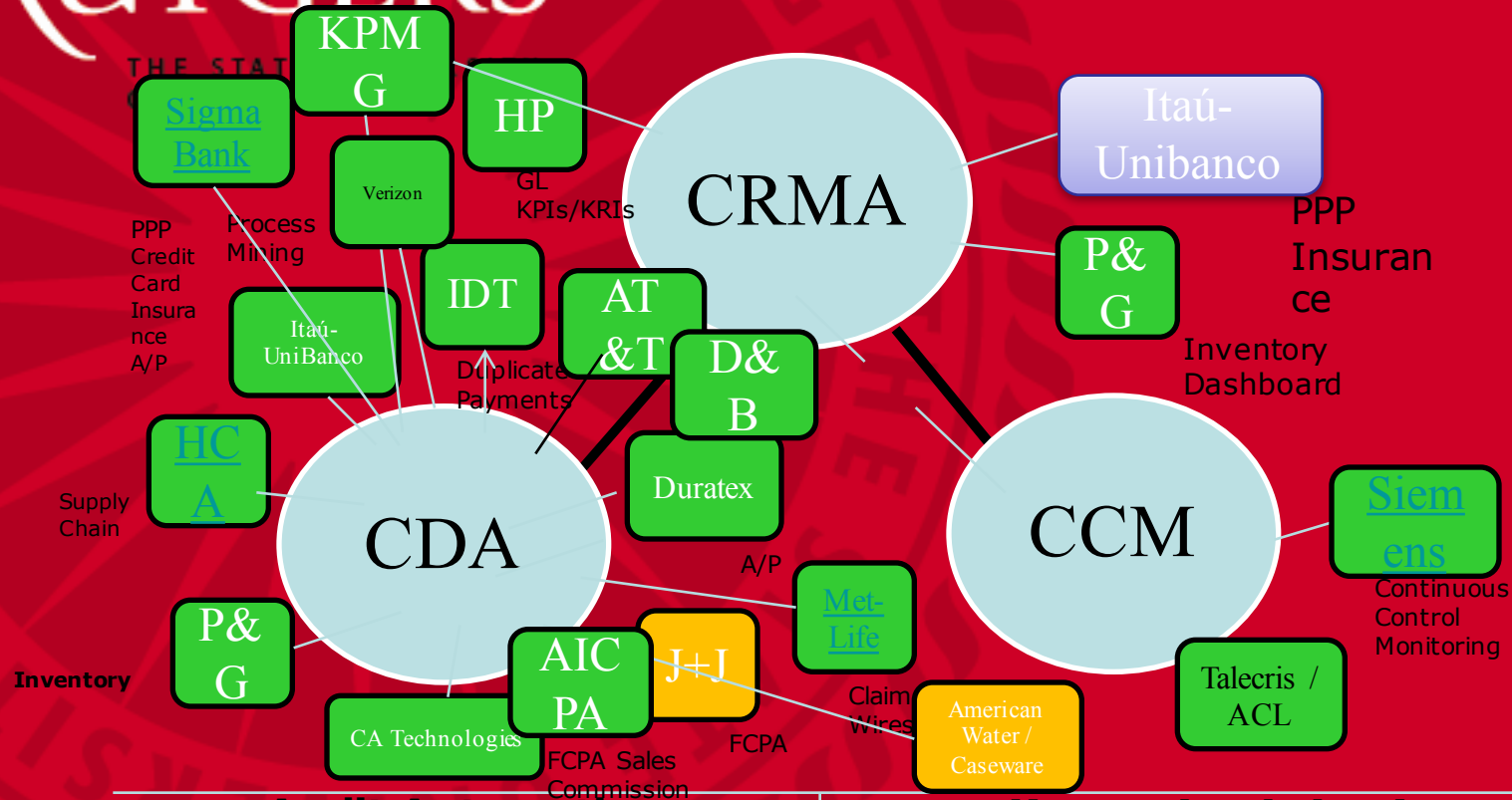
9/14/2016

Continuous Assurance and Audit Data Analytics Outline

- The CarLab
- Evolving Towards Continuous Assurance
- The Audit Ecosystem
- Analytics in Continuous Assurance
- The Regulators' Dilemma
- What could the future hold?

THE CARLAB





Audit Automation

P&G: Order to Cash

Auditor Judgment

Siemens- AAS Automation

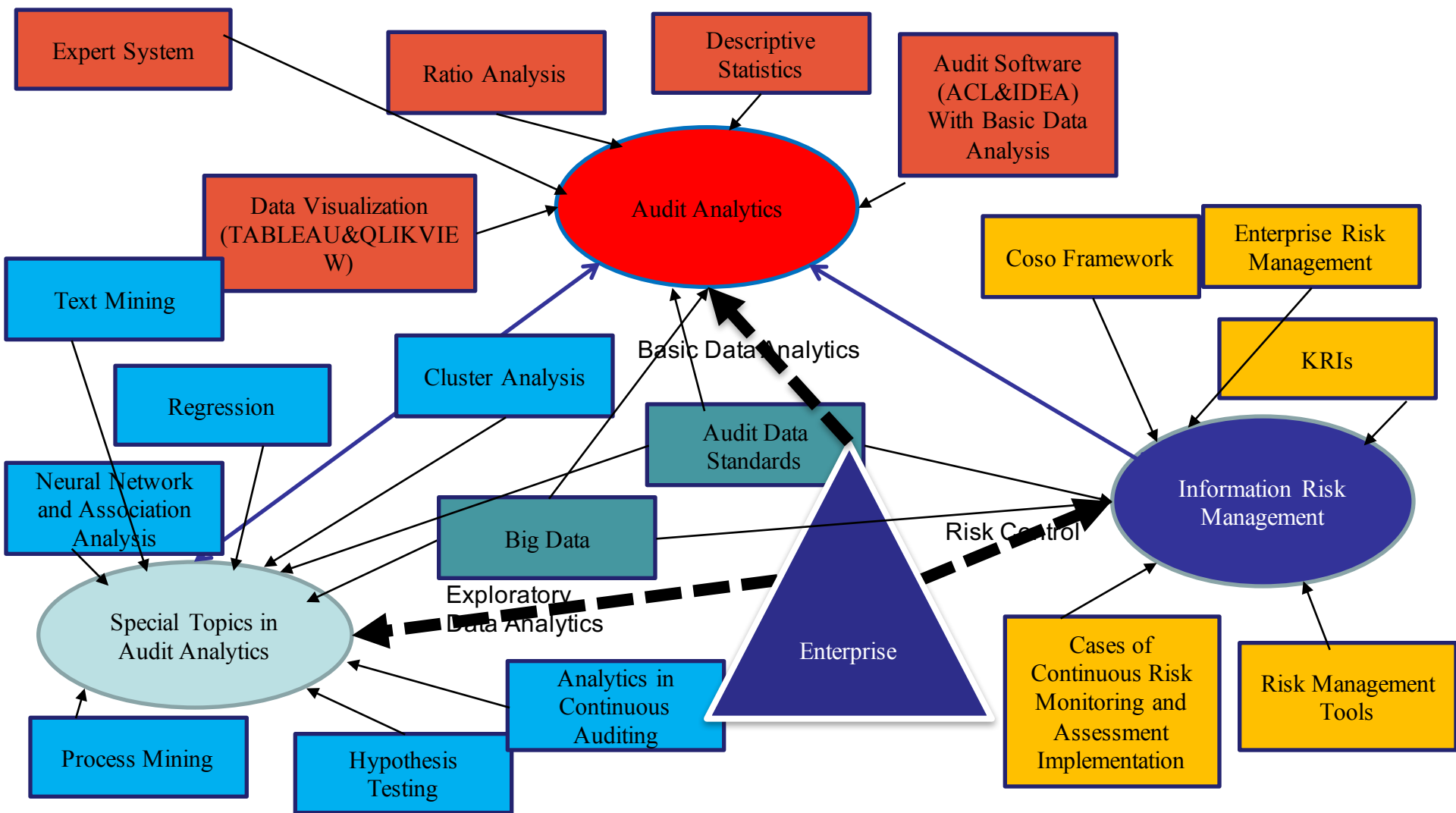
AICPA – ADS / APS

Audit Methodologies

- **Multidimensional Clustering**
- **Process Mining**
- **Continuity Equations**
- **Predictive Auditing**
- **Visualization**
- **Analytic Playpen**

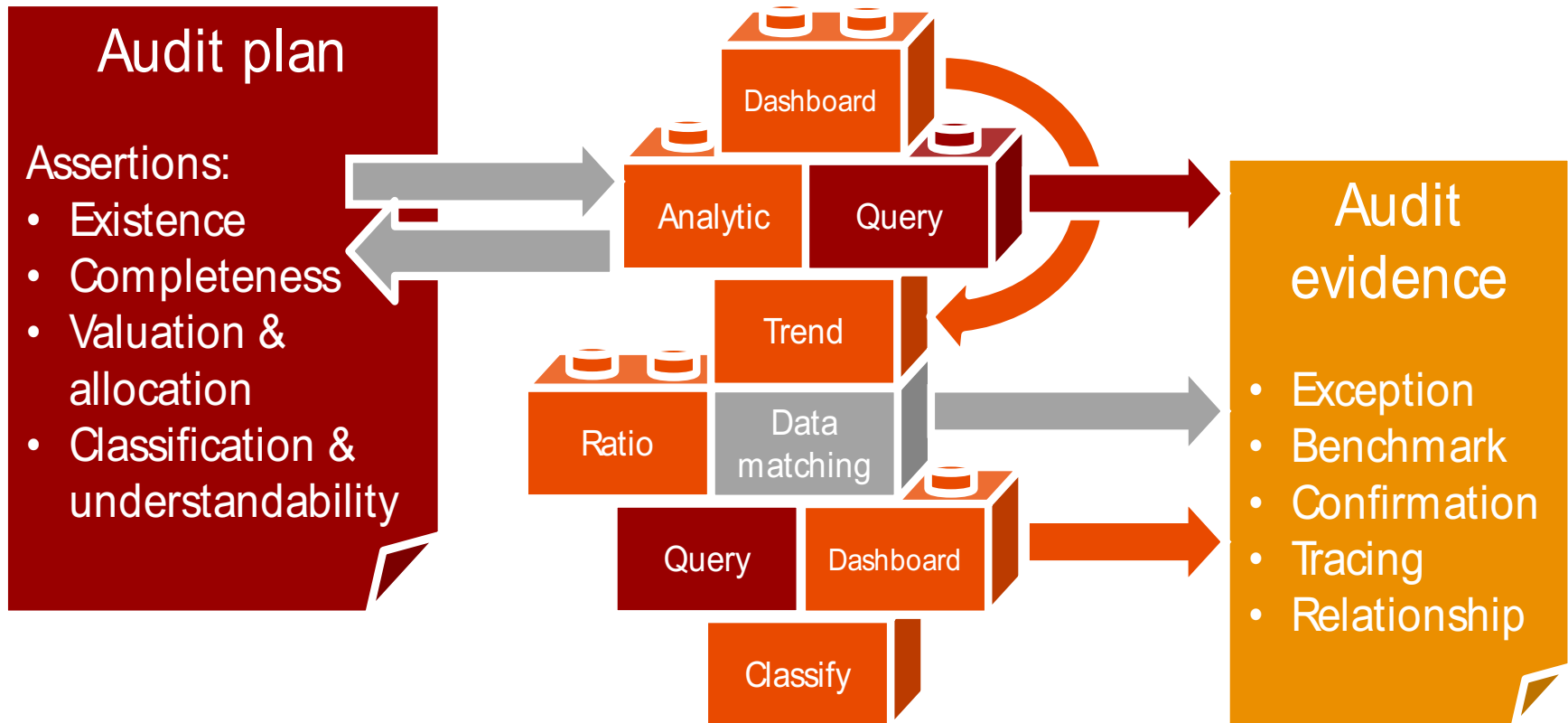
The CarLab

<u>Choosing apps</u>	<u>Predictive Analytics with Weather data</u>	<u>Audit data analytics and EDA</u>	<u>Envisaging the future of audit and Big Data</u>	<u>Text Mining</u>	<u>Monitoring Unibanco's branches</u>
<u>Visualization</u>	<u>Process Mining at Gamma Bank</u>	<u>Expert System for P-Card</u>	<u>Logit regression for control risk assessment</u>	<u>Exceptional Exceptions</u>	<u>Client Retention Project</u>
<u>Litigation prediction</u>	<u>Fraud Risk Assessment using EDA</u>	<u>Detecting duplicate records</u>	<u>Continuity equations</u>	<u>Predictive Audit</u>	Credit card Default prediction
Insurance Analytics	<u>Multidimensional clustering for fraud detection</u>	<u>Rule-based selection for transitory accounts</u>	<u>Continuity Equations at HCA</u>	<u>XBRL</u>	<u>Insurance Analytics</u>

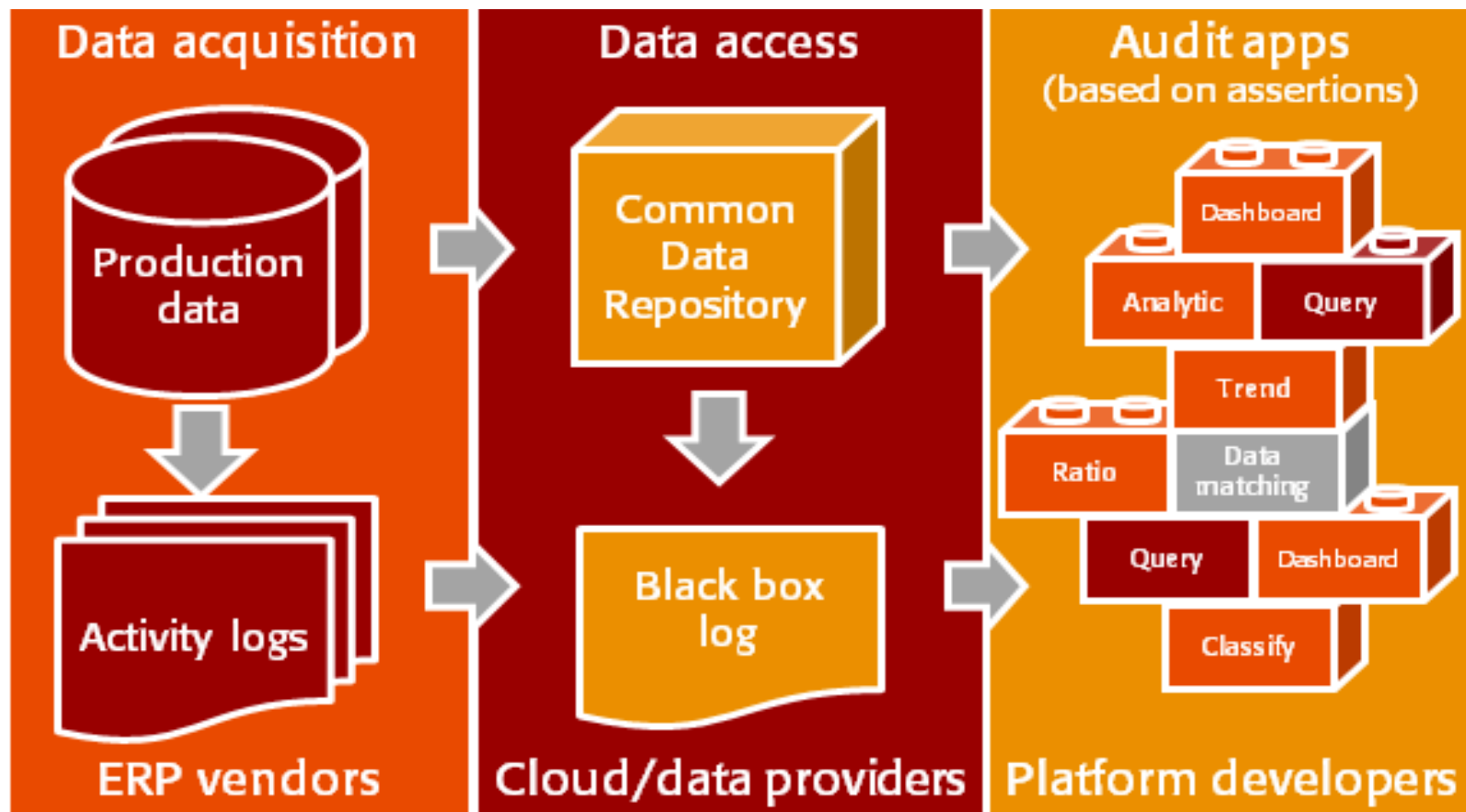


EVOLVING TOWARDS CONTINUOUS ASSURANCE

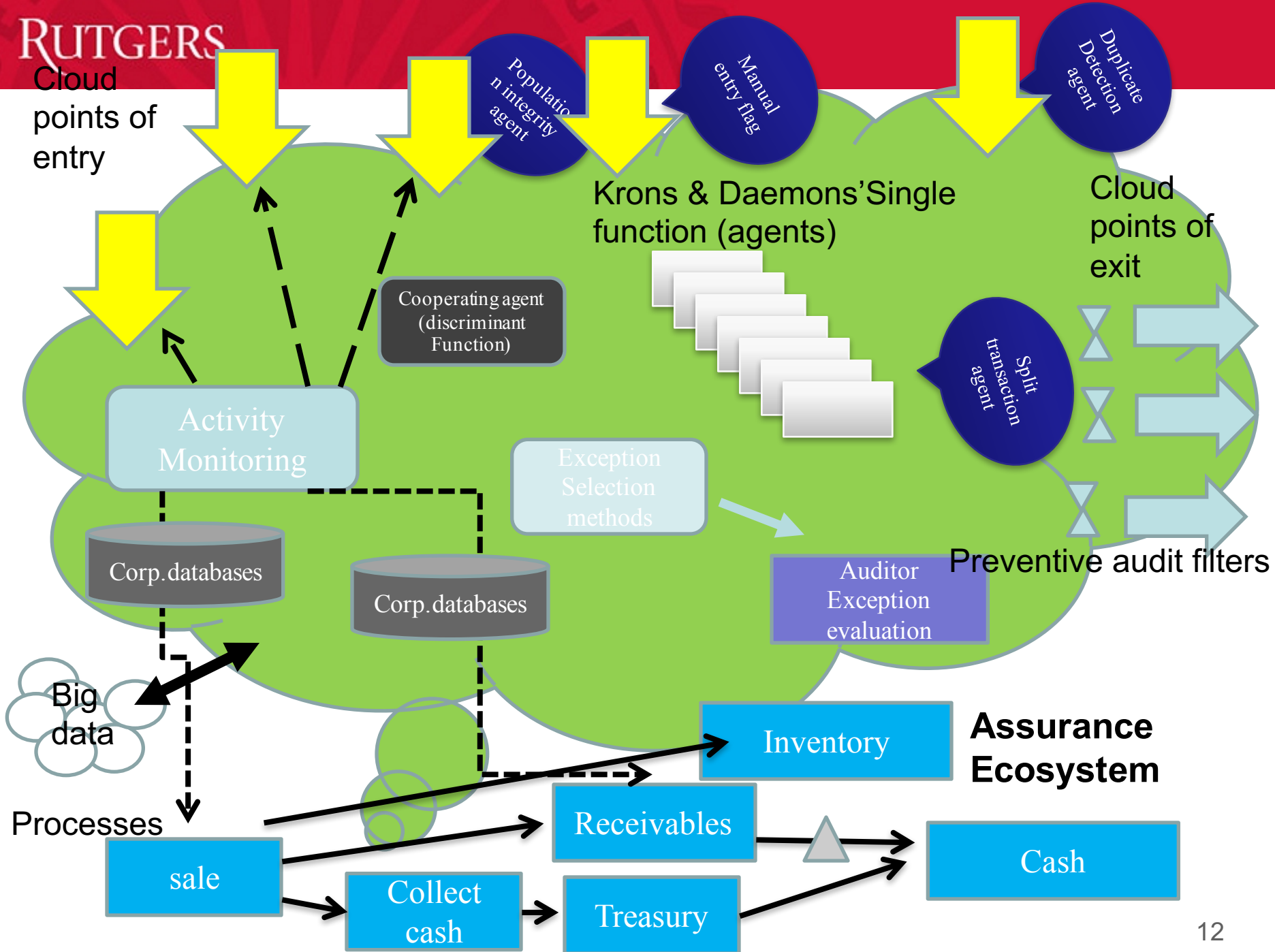
A Progressive Automation Scenario



The Audit Data Standard Architecture



THE AUDIT ECOSYSTEM



ANALYTICS IN CONTINUOUS ASSURANCE

The Regulators' Dilemma

- Revenue Three Way Match
- Revenue segregation of duties
- Predictive Analytics
- Clustering

Illustration 1 – Revenue Three Way Match (cont.)

Entity ABC has revenue of €125 million generated by 725,000 transactions. The three way match procedure is executed with the following results:

	Amount (€'000)	%	Number of Transactions	%
No differences	119,750	95.8	691,000	95.3
Outliers:				
Quantity differences	3,125	2.5	16,700	2.3
Pricing differences	2,125	1.7	17,300	2.4

Note: Materiality for the audit of the financial statements as a whole is €1,000,000.

Illustration 2 – Revenue Segregation of Duties (cont.)

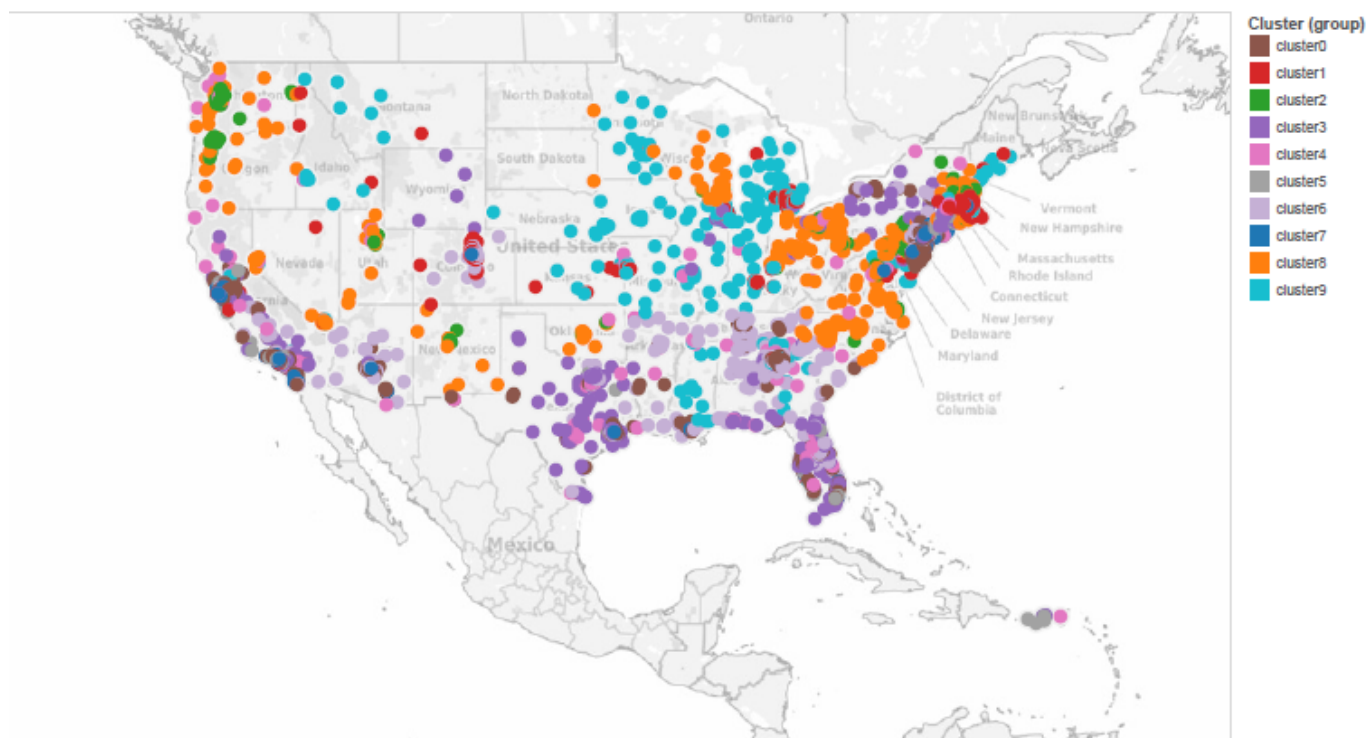
For entity ABC, an analysis of segregation of duties was executed with the following findings:

	Number of users	Amount (€'000)	Number of transactions
Population of sales	542	125,000	725,000
Instances in which same individual created sales invoice, sales return or credit note and applied cash	7	620	3,934
Instances in which same individual executed sales order processing, dispatched goods (delivery document) and applied cash	96	7,692	46,903

Note: Materiality for the audit of the financial statements as a whole is €1,000,000.

Illustration 3 – Predictive Analytic (cont.)

Clustering Using Store Sales by Peer Group



Data Analytics

Questions

- Are predictive analytics relevant to audit data analytics?
- Are predictive analytics a risk assessment procedure, substantive procedure, or both?
- What procedures are necessary to validate non-traditional external data (e.g., social media, weather, traffic patterns)?
- Is it appropriate to reduce or eliminate other substantive tests with predictive analytics? (ISA 330 paragraph 7)
- Should there be guidance of an acceptable level of variance?
- **Should there be an experimentation period to create guidance for predictive analytics?**
- What predictive methodologies would be acceptable?

○ **WHAT COULD THE FUTURE HOLD?**

Data Analytics

What could the future hold?

Machine Learning / Cognitive Computing

- As an alternative to statistical and optimization methods, human decision models can be built either by capturing human behavior and models (expert / cognitive computing) or by using machine learning methods to develop these rules.
- Typically supervised machine learning methods such as decision trees, logistic regression, and vector machines will be used. Possibility that in the future, the volume of data may exceed human capacity to audit that data.

Expert Knowledge Elicitations in a Procurement Card Context at PG
Deniz Applebaum and Abdullah Al-Awadhi

Credit card default and lawsuit prediction at Itau-Unibanco
Miklos A. Vasarhelyi, Eduardo Miyaki, Qi Liu, Jun Dai, Fei Qi Huan, Pei Li, and Basma Modarrat

What could the future hold? (cont.)

Some of the Challenges that Arise – Machine Learning / Cognitive Computing

- Are machine learning techniques relevant to audit data analytics?
- Is it reasonable to reduce or eliminate other substantive tests with machine learning?
- What impact might this reduction have?
- Level of guidance needed on methods?
- Should there be a new method of separate review of the technologies used if these methods are used?
- **Should there be an experimentation period to create guidance for machine learning?**
- What predictive methodologies would be acceptable?

What could the future hold? (cont.)

- Continuous Control Monitoring – formalization of controls evaluation
- Continuity Equations – structural modeling in continuous auditing
- Process Mining in Auditing – audit Logs in Enterprise Resource Planning systems
- Exceptional exceptions – choosing exceptions from huge data
- Evidence from Big Data – electronic logs everywhere
- Audit Data Standard – normalizing data to facilitate analytic applications
- Visualization for continuous assurance monitoring – creating auditor dashboards

Thanks!!

Contact me at

miklosv@rutgers.edu

Visit

<http://raw.rutgers.edu>