

ATTACKING VAT FRAUD WITH REAL-TIME AI

CASE STUDY

INDUSTRIAL AI SOLUTIONS

Industrial-strength AI solutions improve real-time monitoring, simulation, optimization and supervisory control for operational infrastructures, including those for Internet of Things systems, utility grids, manufacturing, oil and gas, government, and commerce.

With partners we build and deploy solutions on our patented Cognitive Reasoning Engine (CRex™) software platform. Our solutions merge the reasoning and analysis power of artificial intelligence, the real-time control and security of industrial automation, and the performance of Big Data and cloud computing.

Use cases include fraud prevention, situational awareness, fast demand response, transactive energy, optimization of industrial energy systems, and water grid optimization.

SOFTWARE AS A SERVICE

We offer as an option deployments within a secure cloud as a SaaS solution to speed up delivery and lower life-cycle costs.

VAT Fraud Drains Governments Globally

Value Added Tax systems operate in about 150 countries collecting 20 percent of the world's tax revenues.

Increasingly VAT has come under siege from large scale fraud. For example a 2014 European Union study estimated annual EU VAT losses at over €170 billion (\$190

billion) with some countries losing over 30% of their expected revenues. At these rates, fraud not only drains government treasuries but leads to higher VAT rates and unfair business competition.

A major challenge in rooting out fraud is the lack of timeliness in collecting and analyzing data. In most countries there are commonly delays of weeks or months between a business receiving a VAT refund from the government and then paying the VAT owed to the government. In what is known as missing trader fraud, businesses collect the refund and disappear before payment.

For retail, the lack of timely point-of-sale data and analysis enables fraudsters to collect VAT from customers, suppress the sales records, and then keep the VAT for themselves.

Brazil's Ceará First to Attack VAT Fraud with Real-Time Artificial Intelligence

Ceará, a Brazilian state of over 8 million residents located in the country's northeast region, is the first in the world to attack VAT fraud head on with AI technologies that work in real time and as part of an Internet of Things (IoT) system. The state's government is working with Cognitum and its partner to deploy an AI-driven solution, named Tax Intelligence System or TIS, that

monitors point-of-sale data for fraud and non-compliance.

European Union VAT fraud losses are estimated at €170 billion per year.

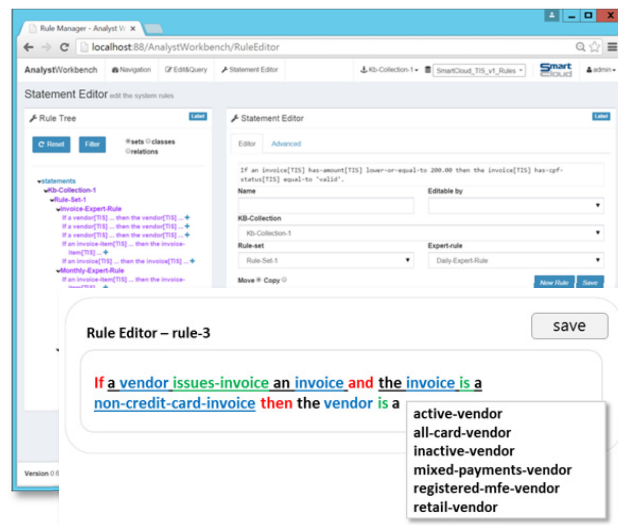
Scheduled for initial roll out in 2016, TIS will analyze over two million retail point-of-sale transactions per day from approximately 60,000 vendors. A new Internet of Things system

will remotely connect government certified hardware devices at each retailer site to transmit point-of-sale transaction data to Ceará's tax agency.

Ceará's target is to identify and prevent at least 50% of all retail fraud and non-compliance, resulting in \$40 million in new revenues.

Empowering Fraud Detection Knowledge

TIS solution empowers Ceará's tax analysts to create and maintain knowledge for detecting fraud and non-compliance situations. The

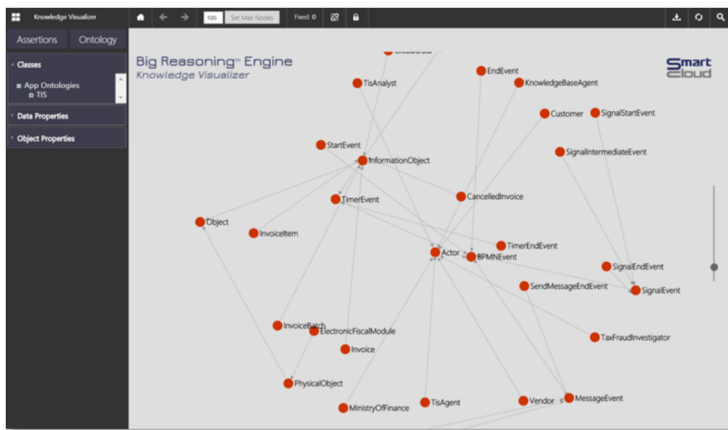


The Tax Intelligence System's rules check time-series transactions for non-compliance and potential tax fraud.

analysts work within a Tax Analyst Workbench to model their VAT collection system, write rules that detect fraud patterns over time, test the rules via simulation, and discover new rules via business intelligence tools.

Key workbench capabilities include:

Visual modeler: For representing the data properties and many-to-many relationships needed for analyzing transaction data. Our solutions use semantic web modeling based on the OWL2 standard.



The Tax Intelligence System represents the data properties and many-to-many relationships needed for AI-driven analysis using standards-based semantic web modeling.

- **Rules Manager:** For business rules that check the compliance of transactions with tax laws and detect time series trends that suggest potential fraud. Tax analysts do not need to learn a computer programming language — they write and update their rules using a structured natural language rule editor.
- **Simulator:** For testing the validity and effectiveness of rules against historical or live data.
- **Discovery:** Advanced semantic query capabilities give extensive flexibility for exporting time-series data sets made up of disparate data sources for analysts to do discovery via business intelligence tools such as Microsoft PowerBI or Tableau.
- **Hybrid reasoning:** Enables rapid integration of third-party analysis tools such as machine learning or Bayesian probability networks available from

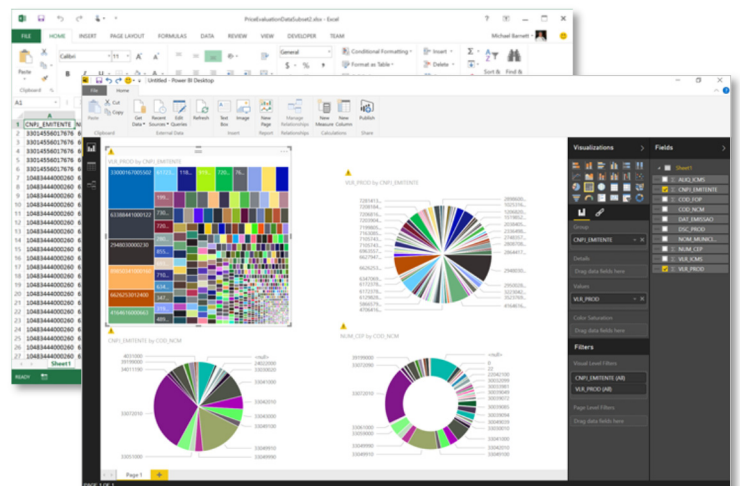
Brazil's Ceará government is targeting \$40 million in new VAT revenues through AI-driven fraud prevention.

sources like Cognitum Ask Data Anything, the open source R project or Microsoft's Azure analytics services. These tools can be applied in real-time to streaming data and embedded within rule logic.

Cognitive Reasoning Engine (CRex) Platform

TIS solution is built and deployed on patented Cognitive Reasoning Engine software platform. CRex is ideally suited for delivering these kinds of time-sensitive, distributed solutions. Underlying capabilities especially relevant to TIS include:

- **Time-stamped semantic database:** Store transactions as time-stamped semantic web records, both uncorrected and corrected, to support temporal reasoning, audits, reporting, and advanced analytics.
- **AI Agents:** These autonomous, goal-directed software programs within the engine continuously check new transactions for errors, automatically making corrections or informing staff as appropriate.
- **Scalable computing:** Can scale processing power as needed to meet peak transaction flows, such as during holiday shopping seasons, by distributing computing loads to AI Agents and by spawning new virtual machines in either on-premises or cloud servers.



The Tax Intelligence System exports advanced semantic queries of time-series data for analyst discovery using Business Intelligence tools.