



SAP Innovation Awards 2019 Entry Pitch Deck

Disrupting Hedge Fund Administration via Machine Learning
Citco



<https://youtu.be/jjWal2ppkrU>

Disrupting Hedge Fund Administration via Machine Learning



Citco

“Quote”

“SAP Machine Learning and Hana was able to automate our reconciliation process after we tried and failed with AWS and other open source alternatives. SAP is a great partner for innovation, and provided guidance and support”.

Tim Mietus

“After solving our Reconciliation problem with Machine Learning we are now re-thinking how we approach all of our operational processes. After this initial success Citco has developed a steering committee which will use design thinking techniques to digitize our services.”

Phil Edelstein

Challenge


Although Citco’s reconciliation process can match 92% of transactions via their rules based system the remaining 8% required 1000 people to manually match to meet their SLA’s. The challenge is to reduce the amount of manual matching for this mission critical business process.

Solution

Hana Machine Learning models automated the manual matching with significantly high confidence, and are now part of process that runs every day within AWS. The Hana solution is supported via HA and DR environments across AWS zones.

Outcome

Citco is in production and has already significantly reduced the amount of manual matching. Currently they are automatically matching 30,000 per day and anticipate that number to grow to 90% of all manual matches.



Automated Matching via Machine Learning reduces risk caused by human error, and improves financial controls.

Growing their business is easier because adding new customers now does not require them adding employees.

Meeting SLA’s is easier because ML powered process runs in under 10 minutes, and reduces the number transactions that need manual matching.



Business Challenge & Objectives

Citco, A Hedge Fund Administrator, receives “post trade” transactions from Customers and Brokers everyday and there is no “uber-id” to match them together. Everyday after the markets close Citco must match these transactions via an internal application built upon rules. After 10 years of rule development they could only match 92% of the transactions with their application. The rest of the transactions must be matched **manually** by over **1,000 people** in a six hour window in order to meet SLAs. Once the transactions are reconciled Citco performs regulatory, financial, and other critical functions for their customers.

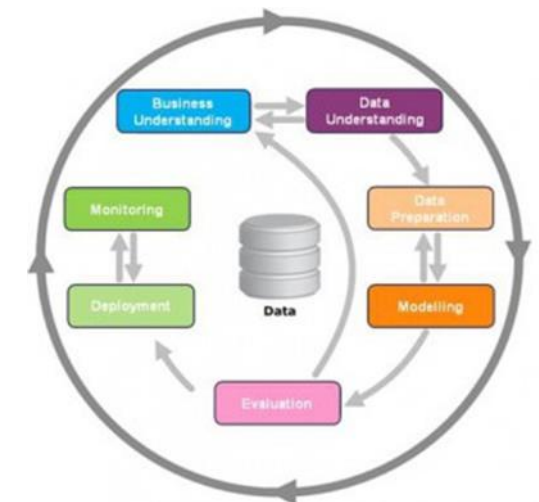
Manual Reconciliation presents numerous challenges for Citco. In addition to the inevitable errors made by humans this manual process made it difficult for Citco to scale their business. If they added another customer they needed to add more people to complete the reconciliation. Maintaining the rule based application is difficult: creating, testing, and user acceptance testing is a cumbersome process. Manual Matching transactions 8 hours a day is not a great task for humans and errors are a function of individual differences and randomness. Overall errors in reconciliation cause problems for their clients, and is a source of poor customer experience.

Reconciliation



After Design Thinking Sessions we selected Automation of Trade Reconciliation as the most impactful problem, and both Citco and SAP put together a co-innovation team. We used CRISP-ML methodology, and fit that process into their Agile SDLC. The objective for Citco was to use Machine Learning to automate the reconciliation process for transactions that were not matched by their rule engine.

Some of the requirements were: minimize the number of false positives around matching transactions, integrate a cloud based solution into the existing on premise IT infrastructure, complete the reconciliation in under 10 minutes, remove any personal identifying information & anonymize customer data, implement High Availability and Disaster Recovery environments, and reduce the amount of manual matching by 10%. In addition, the Reconciliation business owners at Citco required a solution that was explainable. They needed a solution which they could explain both to internal and external stakeholders.





Project / Use Case Details

Citco is one of the leading Hedge fund Administrators in the world with **1 Trillion dollars** of assets under administration, **6200 employees**, and over **60 worldwide offices**. While their reconciliation platform was already the leader in the industry the amount of manual effort required **1,000 humans** everyday to meet their customer SLAs. Manual matching by humans is error prone, does not scale, requires training, and certification. One of the interesting details around this use case is that Citco had no prior SAP footprint, and is a “Net New” customer.

The Citco and SAP co-innovation team worked for 7 weeks to build an initial Machine Learning model to explore if we could automate their Reconciliation process. There were numerous challenges building the initial model especially around the Data. Citco IT processes never saved incorrect examples that are required for Machine Learning Classification models. As a result the team came up with an approach in Hana to create the **bad examples** by using a **partial cartesian join**: 70% of the **data was synthetic**, and 30% were real historical examples. In working with Citco the SAP Data Scientists determined that instead of using the original fields from the transactions that a better approach was to create 800 features which were differences between the Broker and Customer data. These difference fields were created with **Hana Calculation** views and were needed for **model building** and **scoring**. Some features were Text Fields, and Fuzzy matching proved useful in building the model. After creating the analytical data set with calculation views the models were built using the Predictive Analytics APL Classification algorithm. The models overall **predictive power** is greater than **99.99%**.

The initial goal of the Machine learning was to reduce manual matching by 10%, but with the models being so powerful the Citco team came to the conclusion that they **can automate 90% of manual matching!**

After building models the Citco team started the process of integrating on premise reconciliation systems with Hana that is on AWS. They created an application where data flows from on premise data centers into AWS, and back using **Lambda** functions. Citco had to build dashboards and stand up numerous environments in order to make this a production ready, and part of their mission critical infrastructure. In addition, the team had to work closely with the Reconciliation business owners around “Change Management” which was a challenging as the underlying technology. The APL scoring provides reason codes for why transactions were matched, and this “**Explainability**” feature was critical for the business owners.

Embedding Machine Learning into operational software system and allowing it to power decision processes is an extremely difficult task. Building models is easy, but embedding them into an operational system is an incredible feat of engineering. **Go Live** was December 3, 2018.



Benefits and Outcomes

Business / Social

As of today they continue to improve and refine the process and 30,000 transactions a day are reconciled via ML. The expectation is by end of year they will achieve 90% automated matching.

Citco business leaders are astonished at the power of Machine Learning, and believe it is the key to transforming their business. They are now examining all business processes, and determine which ones should be automated via ML and RPA.

They are talking with their customers about how ML will revolutionize financial processes, and are exploring new services they can offer based on these new capabilities.

IT

Citco IT continues to build and improve the infrastructure around the Recon process. They learned that data science is critical to automating processes. They have started hiring and looking for more people with Data Science backgrounds. They still need to create a more sophisticated approach for monitoring Machine Learning performance.

The next steps include more flexible approach to model management, and automated switching of models. In addition, they will implement A:B testing approach so that there are always a small percentage of transactions that are manually matched.

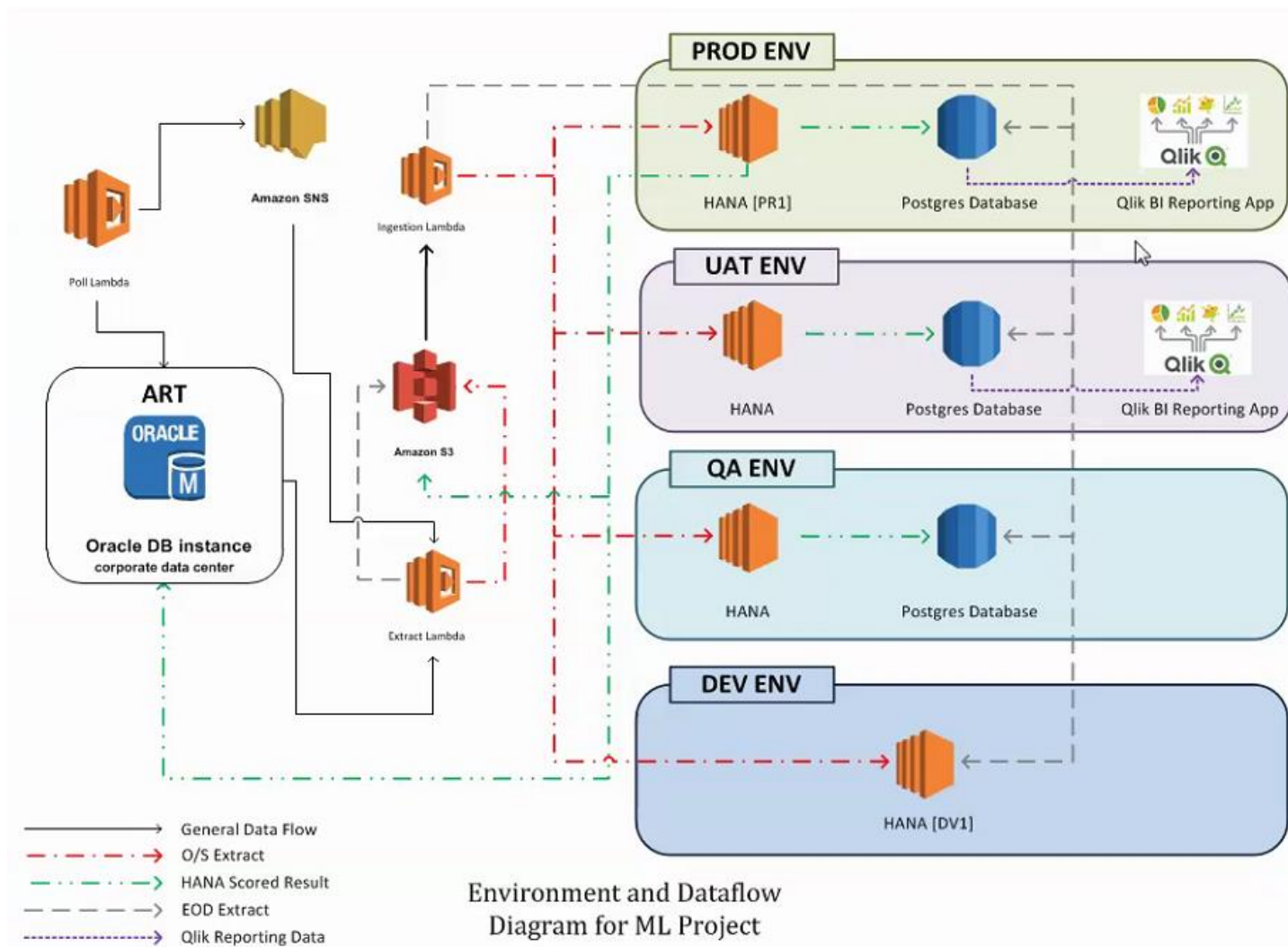
Human Empowerment

Citco now realizes that they need a framework which encourages employees to embrace machine learning. Leadership recognizes that they need ML evangelist for both internal and external stakeholders. As certain types of jobs disappear they will need new types roles that explain and sustain ML based processes.

Explainers and Sustainers are not data scientists, but are business people with knowledge of process and who can tell stories around data.



Architecture





Deployment

Date of Deployment or POC: December 3rd, 2018

Number of live users:

This application has people who support it (10), but it automates the work of large number of employees. It does not have end users per say.

SAP Technologies Used:

SAP Hana

Production & POC

SAP Predictive Analytics

POC / Adhoc support

SAP Cloud

POC

Server Processor: Intel

Linux Distribution: Red Hat

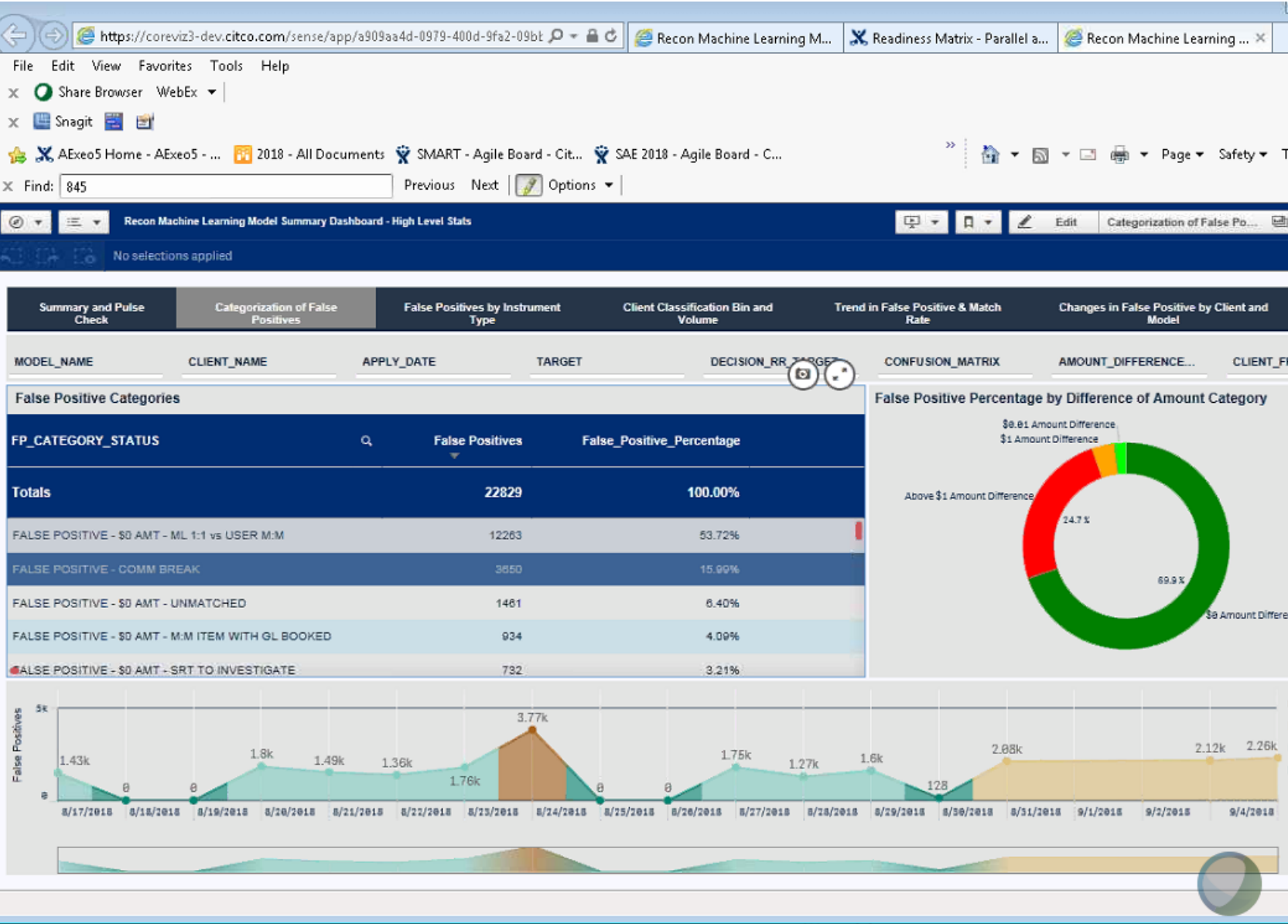


Emerging Technologies and Use Cases

The following Emerging Technologies and use-cases are part of the project and describe the contribution

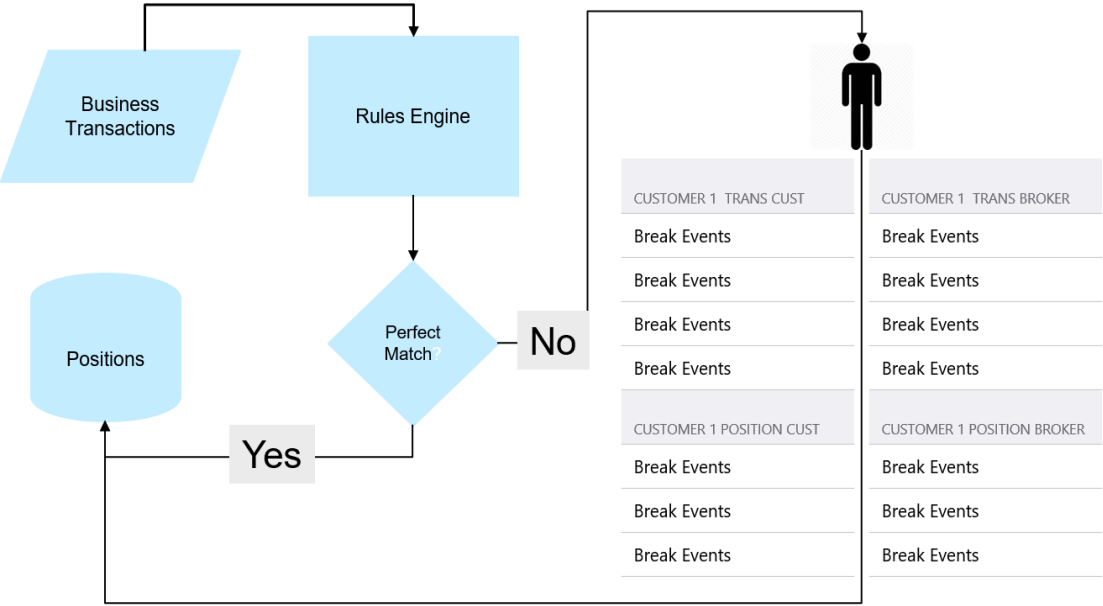
	Technology or Use Case	Yes/No	Contribution to Project
1.	Machine Learning / Artificial Intelligence	Yes	Machine Learning Models are key to entire process.
2.	IoT		
3.	3D printing		
4.	Blockchain		
5.	API Economy / Integrate the Intelligent Enterprise		
6.	Cloud Native / Event Based Architectures	Yes	Only way to make this saleable solution was to use Hana in AWS
7.	Extending the digital core with SAP CP / ABAP in SAP CP		
8.	SAP Leonardo Application (extending SAP application, using Industry Innovation Kits or result of Design Thinking workshop)	Yes	Design thinking was critical part of process

Example Citco Dashboard Measuring ML Powered Reconciliation

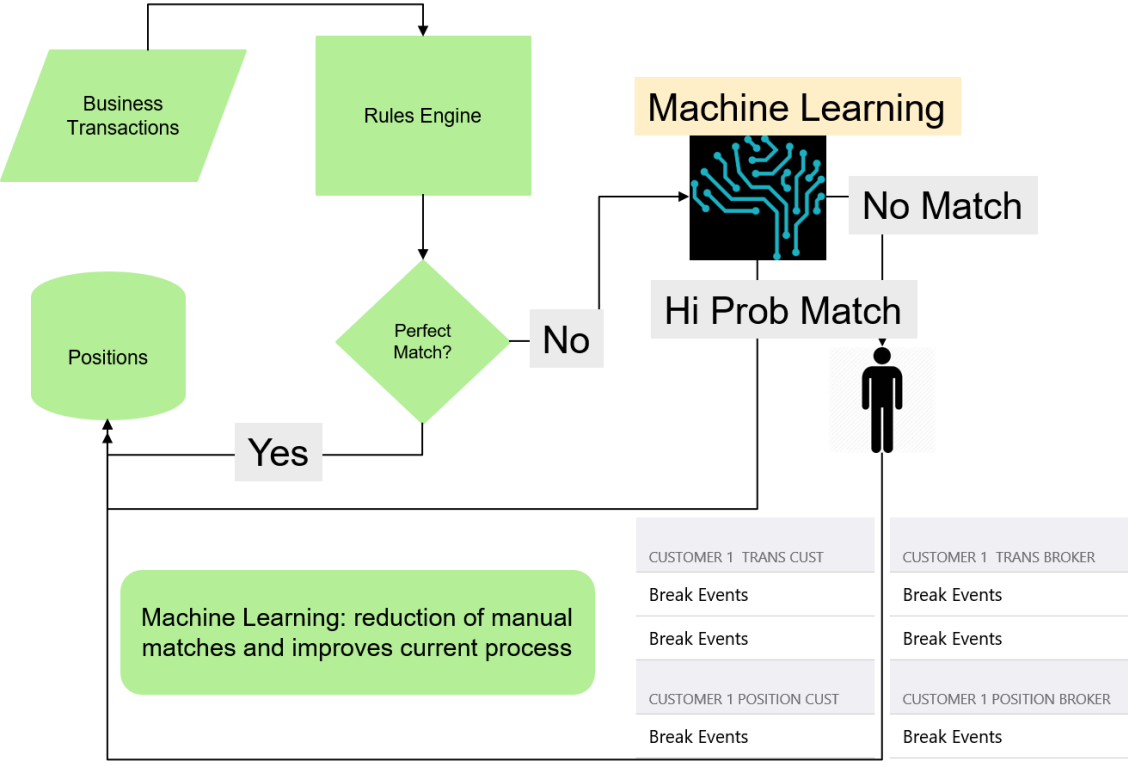


Reconciliation: Rules Versus ML + Rules Powered Solution

Rules Based Reconciliation



Rules & ML Reconciliation



EVOLUTION FROM RULES-BASED TO ML-BASED RECON

Citco reached an asymptote with their Rules Powered system. To improve they had to implement Machine Learning

