Changing the Internal Audit Game: Citi Uses AI to Drive Innovation

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Introduction to Audit Innovation

Our Mission

Smarter Auditing – significantly improve the control environment and assurance through large population testing, anomaly detection, and new techniques

Smarter Testing
- Deeper testing through automation and full population testing
- Use of multiple solutions to help identify thematic patterns across countries and entities

Insightful Risk Assessment
- Identifying emerging risks and issues to drive insights and connect the dots
- Using data and integrated platforms to uncover hidden patterns and develop new hypotheses

Improving the Auditor Journey
- Using technology and innovation to support the auditor of the future
- Sharing subject matter expertise, yielding insights and popularizing a data driven mindset
Why Automation?

When auditors spend their time on highly repetitive and mundane tasks, it reduces the amount of time that they can dedicate to stakeholders or high value-add activities.

Benefits for the Auditor

- Reduction of error rates and added assurance by testing full population
- Auditors are more empowered from the utilization and exploration of data, augmenting their decision-making and creating the auditor of the future
- Auditors can identify emerging risks and issues to connect the dots and drive strategic conversations with stakeholders

Benefits for the Stakeholder

- Real time escalation of thematic issues
- Widespread use of data helps gain an understanding and strengthening of entire control environment, providing thematic insight
- Timely identification of issue themes and root causes enhances business controls

Degrees of Automation

Robotics Process Automation is any programmable device that can perform tasks and interact with its environment without the aid of human interaction or altering existing tech infrastructure.

Levels of RPA Sophistication

- Task Automation
  - Process of automating repetitive tasks
  - Implementing rules and logic
  - Linear task
  - Orchestrated activities

- Machine Learning & Natural Language Processing
  - Analysis of past and present data sources to make algorithmic predictions
  - Using thematic analysis to identify emerging risks and regulatory policy matching
  - Non-standard
  - Contextual
  - Understand different process images to text
  - Understand and learns

- Cognitive / AI
  - Machine programmed to think, work, evolve and react like humans
  - Helping humans become faster and smarter at the tasks they’re performing

- Systems Self Aware
  - Predictive
  - Self Learning
  - Self Healing
  - Predicts future behaviors
  - Virtual Assistants
  - Auto Feedback
Robotics in Audit

Quality Assurance - Indicator Dashboard / Robot

Utilizing dashboards and robots to sharpen the QA process, reviewing the full population of audits applying indicators of quality issues and leveraging robots to automate manual data extractions

**Robotics**
- Visually display how 100% of completed audit files and audit teams perform against select attributes through an indicator dashboard
- Samples selected for review are intelligently targeted towards audit files and audit teams with indicators for potential lower quality

**Traditional Approach**
- Labor-intensive: **16 hours** to review one Audit
- Sample sizes leads to smaller percentage reviewed – # of Audits subject to QA review

**Innovative Approach**
- Robot performs extraction, leaving auditor with more time to perform quality review
- Robot reduces review time from **16 hours to 12 hours**
- Increased penetration rate
- Robot usage allows for a significant increase in audit review per year

**Impact**
- 100% of completed audit files and audit teams screened
- Time saved now dedicated to increased and qualitative review

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Robotics in Audit

FINRA License Testing Bot

Advanced robotic techniques automate manually intensive tests which are repeatable to increase efficiency while enhancing audit assurance

**Robotics**
- Programmable device that can perform tasks and interact with its environment, without the aid of human interaction
- Implementation without altering existing tech infrastructure
- Utilizes automation, machine learning, and cognitive / artificial intelligence

**Traditional Approach**
- 15 minutes to manually check one broker would take 1 year to test 5500 brokers
- 5% error rate and sample size of 25

**Innovative Approach**
- 1 minute to check one broker
- 0 Hours used by auditor for testing, allowing auditor to focus on exceptions
- 100% population testing

**Impact**
- Enhanced assurance through increased sample size
- 100% of broker populations tested in 3 business areas
- Time Savings through the automation of repetitive manual tasks
Machine Learning and Natural Language Processing in Audit

### Customer Complaints

Monitoring of complaints and social media data to identify trends and emerging themes to improve risk assessment and predictive risk capabilities

<table>
<thead>
<tr>
<th>Machine Learning &amp; Natural Language Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Sourcing Complaints from social media to enable early risk identification and intervention</td>
</tr>
<tr>
<td>✓ Differentiate between comments and complaints</td>
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<tr>
<td>✓ Categorize complaints into appropriate category</td>
</tr>
<tr>
<td>✓ Visualize data to identify outlier activity and emerging risks</td>
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</table>

<table>
<thead>
<tr>
<th>Traditional Approach</th>
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<tbody>
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<td>✓ Limited to sampling of internal complaints</td>
</tr>
<tr>
<td>✓ Reactive vs predictive – utilizing social media as a leading indicator</td>
</tr>
<tr>
<td>✓ Requires time consuming manual reading and categorization of applicable complaints</td>
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<th>Innovative Approach</th>
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<tr>
<td>✓ Millions of messages analyzed in &lt; 3 hours</td>
</tr>
<tr>
<td>✓ Consistency in categorization without individual bias</td>
</tr>
<tr>
<td>✓ Potential leading indicator of formal complaints and other risk factors</td>
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**Impact**

- Leveraging solution to identify areas of increased risk based on customer experience
- New data points to identify emerging risks and hidden patterns
- Lending insight that can be used for audit scoping and business monitoring

### Root Cause Analysis

Gain insights into Issues and Corrective Action Plans through a root cause analysis that uses Natural Language Processing and Machine Learning techniques

<table>
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<tr>
<td>✓ Analyze Issues and Corrective Action Plans from a root cause perspective, enabling more depth and breadth in understanding of risks</td>
</tr>
<tr>
<td>✓ Enable better, more risk-based approach to issue management</td>
</tr>
<tr>
<td>✓ Pre-empt occurrence of problems through focus on root causes</td>
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<table>
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<th>Traditional Approach</th>
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<tr>
<td>✓ Standard analysis</td>
</tr>
<tr>
<td>✓ Manual approach to root cause</td>
</tr>
<tr>
<td>✓ Symptomatic and siloed approach</td>
</tr>
<tr>
<td>✓ Limited ability to &quot;connect the dots&quot;</td>
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<table>
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<th>Innovative Approach</th>
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<tr>
<td>✓ Machine Learning and Natural Language Processing techniques</td>
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<tr>
<td>✓ Broader and deeper understanding of issues based on root causes</td>
</tr>
<tr>
<td>✓ Risk-based approach to addressing problems across lines of business</td>
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</table>

**Impact**

- Large percentage of the issue population categorized into 17 root causes
- Horizontal analysis of root causes leading to deeper insights
- Improve control environment more strategically and substantively
- Tool for enhanced audit scoping and business monitoring
Robotics, Machine Learning and Natural Language Processing

Enterprise Platform

Web-based solution execution platform which centralizes Innovation tools for every phase of the audit life cycle, enabling consistent & globally accessible monitoring, testing, & reporting

Enterprise Platform

- Web-based solution execution enables global on-demand testing and monitoring
- One stop shop for all Innovation offerings including Online Solutions, Packaged Solution and Robotics requests
- Allows the audit team to leverage analytics and innovation throughout all phases of the audit life cycle

Traditional Approach

- Use of Analytics limited to auditor skillset
- Analytics performed in siloes
- Solution execution performed on an ad-hoc basis

Innovative Approach

- Solutions & Bots at the click of a button
- Customized threshold monitoring & alerting
- Consistent use of control tests

Impact

- Cross-functional and utilized by auditors and business leaders
- Empowers auditors to embrace data driven mindset
- Reduction of manual documentation and mobile compatibility, facilitating auditor of the future

Innovation in all Organizations

Audit Innovation can take many forms

Forms of Innovation

- Advanced Analytics
- Integrated Solutions
- Alerting and Insights
- Natural Language Processing
- Machine Learning
- Augmented Intelligence

Benefits

Small Organizations

- Solutions can apply to processes firm-wide (dependent on level of specialization)
- Fewer disparate data sources
- Less complexity
- Intra-firm rules and guidelines can be easier to navigate

Large Organizations

- Larger, leverage-able infrastructure
- More data for advanced modeling
- Greater resources

Impact

- Complementing and augmenting traditional processes to drive insight
- Leveraging Technology and Big Data to increase assurance
- Developing Fail-Fast and Agile strategies to rapidly launch innovative solutions

Invest in the power of innovation to drive efficiency and effectiveness throughout your audit process
Thank You!