JOURNAL ENTRY TESTING
Using Machine Learning / Artificial Intelligence to meet and exceed the requirements of CAS 240
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Introduction

Since the start of the new millennium there have been numerous attempts to tackle the problem of financial statement fraud. One of these attempts was the Sarbanes-Oxley Act (SOA), introduced in 2002 in the US, that increased the auditor’s responsibility relating to fraud.

Even though these attempts were a step in the right direction, they didn't stop financial statement fraud from happening. Companies like Hertz, Tech Data, ICE Electronics, Orthofix, Tesco, and Toshiba all were victims of financial statement fraud. Needless to say, all of them had audited financial statements.

With every high-profile case that makes the news, questions arise surrounding the integrity and capabilities of the auditing process. These questions increase the doubt investors and other stakeholders have in the assurance of the audited statements.

The data shows that rules alone don’t work

Existing practices in financial anomaly detection typically use business rules to identify breaches of control. An example of such a rule is a transaction amount limit.

Rules-based systems are the backbone of current auditing systems, but they have been known to be failing to find material financial misstatements, or indeed fraud. These are not effective because rules can be circumvented by a clever fraudster and can only capture what is explicitly coded into them.

Consider that a rule needs to be designed and implemented for each circumstance that requires control or management. This means rules based systems will not catch unanticipated scenarios. Even with the example of the transaction amount limit, the commonly known way to ‘work around’ simple limit rules is transaction splitting. Often the rules themselves create the opportunity or scenario for the exploit. The data from the ACFE (Figure 1) shows that the higher the...
education level of the perpetrators, the higher the loss the organization suffers and in most scenarios the perpetrators have at least a University level education.

The most likely means of which a fraudster gets caught today is through a tip-off, roughly 40%, and industry associations advise organizations to implement “fraud hot lines” to gather these tips. Conversely automated controls and IT systems based on rules only catch a small percentage of scenarios — approximately 3%.

The rate of fraud is increasing and the time to detect fraud is also increasing. In almost every measurable way rules based systems which use data sampling are losing this battle. To compound the problem, Lexis Nexis estimates that the cost to correct $1 of fraud is $2.40.

It’s time for a change because clever people will figure out a way around rules.

### Detection Method

<table>
<thead>
<tr>
<th>Detection Method</th>
<th>Percent of Cases</th>
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<tbody>
<tr>
<td>Tip</td>
<td>37.0%</td>
</tr>
<tr>
<td>Management Review</td>
<td>14.3%</td>
</tr>
<tr>
<td>Internal Audit</td>
<td>14.1%</td>
</tr>
<tr>
<td>By Accident</td>
<td>7.2%</td>
</tr>
<tr>
<td>Account Reconciliation</td>
<td>6.1%</td>
</tr>
<tr>
<td>Other</td>
<td>5.5%</td>
</tr>
<tr>
<td>Document Examination</td>
<td>4.8%</td>
</tr>
<tr>
<td>External Audit</td>
<td>4.0%</td>
</tr>
<tr>
<td>Notified by Law Enforcement</td>
<td>2.5%</td>
</tr>
<tr>
<td>Surveillance/Monitoring</td>
<td>1.9%</td>
</tr>
<tr>
<td>IT Controls</td>
<td>1.5%</td>
</tr>
<tr>
<td>Confession</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

A Better Approach Exists

At MindBridge we believe in the analysis of 100% of transactions and not in the sampling of data. We also believe that sensible business rules based controls can help, to comply with existing audit recommendations, but vitally these methods need to be combined with advanced analytics and data science. You don’t want to choose one approach or the other, but instead a blended approach.
The use of Machine Learning significantly improves the effectiveness of anti-fraud controls by identifying outliers and anomalies by combining rule-based techniques with robust algorithms that enhance accuracy based on what they observe. Machine learning uses modeling and makes data-driven predictions about a given situation. Machine learning is one way for the system to feed what it learns back into the anomaly detection engine, and the more exposure to data they have the smarter they become. This is important because it alleviates the manual rules maintenance and decision making that has proven slow and ineffective in the previous generation of financial anomaly detection.

By doing this, financial auditors have access to not only a data scientist in a box but a virtual forensic auditor that brings potential misstatements to the attention of the auditors. At the same time the auditor can select from a number of well accepted fraud scenarios (control points) and have the financial statement reviewed based on his/her risk-assessment and be in compliance with audit standards.

In this document, we describe how the MindBridge tool addresses (and exceeds) the requirement from the Canadian Audit Standard 240 (CAS 240).

**Introduction to CAS 240**

CAS 240 is the Canadian Audit Standard that deals with the risk of management override of control. This standard needs to be met in all financial audits regardless if the auditor’s risk assessment gives concern for such an override or not. This risk is unpredictable and requires special audit considerations.

The main approach suggested to address this risk is to test journal entries for material misstatements due to fraud or error. It is acknowledged by CPA Canada that practitioners struggle with this objective. The wide spread use of sampling techniques to select journal entries for testing gets increasingly criticized.

To assist practitioners a five step approach is proposed to guide auditors through the process of identifying and testing journal entries:

- **Step 1**: Understand the information system and business processes relevant to financial reporting.
- **Step 2**: Make inquiries of individuals about inappropriate or unusual activity relating to the processing of journal entries and other adjustments.
- **Step 3**: Select the journal entries and other adjustments with characteristics of potentially inappropriate journal entries and other adjustments.
- **Step 4**: Test the appropriateness of journal entries and other adjustments.
- **Step 5**: Document.

Each of these steps is described in the following section, and identify how MindBridge meets and exceeds the CAS 240 requirements.
Steps 1 & 2: Understand information system and make inquiries from individuals

The auditor needs to sufficiently understand a business to identify weaknesses in their information systems. Such weaknesses are enablers of inappropriate or unauthorized journal entries and a potential starting point for financial statement fraud.

The following CPA Canada examples identify potential management motivators to misrepresent the results or financial position of a company:

- For personal gain (e.g., salary, promotion, bonuses)
- To meet targets
- To meet debt covenants
- To satisfy the requirements of third parties

How does MindBridge help?

The screenshot to the right displays a GL risk summary in the MindBridge dashboard. This summary provides auditors a high-level overview of a company’s financial risk exposure. MindBridge groups all journal entries into high/medium/low risk items based on fraud indicators that are well accepted in the profession, and those derived by machine learning-based anomaly detection.

The auditor can inquire about specific transactions that are at risk in order to identify weaknesses in the information system. The application recognizes data-sets from popular accounting packages including QuickBooks, Sage 50, Great Plains, and continues to expand. MindBridge’s smart data-ingestion significantly reduces the effort required to shape and format files for pre-planning the GL analysis.
As highlighted by CPA Canada, there is a significant risk of management recording falsified transactions towards the end of the reporting period to meet certain targets. However, as further highlighted it is important to consider all transactions and not just the ones recorded close to period end.

An important first step before analysis starts is to confirm the completeness of a general ledger. CAS 240 suggests sequence gap testing and to conduct a roll-forward of the transactions.

After the completeness check, and based on steps one and two, the auditor should identify transactions for testing. These identified transactions should fall within the identified risk areas (areas with opportunity for management to misstate the financial statements).

CPA Canada proposes journal entries for testing that are:
- Made to unrelated, unusual (e.g. unusual combinations of debits and credits), or seldom used accounts
- Made by individuals who typically do not make journal entries and other adjustments
- Recorded at the end of the period or as post-closing entries that have little or no explanation or description
- Recorded at an unusual time for the entity
- Recorded outside of the normal course of business
- Dated outside of the regular recording period, for example, beyond the number of days included in the client's standard closing process, or
- Applied to accounts that:
  - Contain transactions that are complex or unusual in nature
  - Contain Significant estimates and period-end adjustments
  - Have been prone to misstatements in the past
  - Have not been reconciled on a timely basis or contain unreconciled differences

It is further suggested by CPA Canada to test 100% of transactions and not disregard transactions because they are of a low dollar value. It is also appreciated that potential misstatements will look different from business to business depending on sector, size etc. and hence tests should be customized. In addition, CPA Canada proposes an element of unpredictability when selecting transactions for testing.

**How does MindBridge help?**

MindBridge assists with the completeness test by checking for sequence gaps in the transactions and also performing a roll-forward of all transactions for easy comparison with the trial balances.

Once the completeness is confirmed, the MindBridge application offers a number of tests to check for indicators of financial misstatements. These tests are either rule-based (eg. weekend posts) or machine learning-based (e.g. unusual transactions, seldom used accounts, etc.).

MindBridge's rule-based algorithms can be customized to consider client-specific risk areas. For example weekend entries might be normal business practices for one company but highly suspicious for another.
The machine learning-based component of the MindBridge application assists in reviewing the transactions in relation to unusual combinations of debit/credit value as well as to identify rarely used accounts. The MindBridge application also includes a statistical outlier detection test to catch anomalies that are “unusual”, and which the auditor might not have thought about.

Based on the analysis, a risk-score is assigned to each transaction and is grouped into low, medium, and high-risk categories for easy prioritization and review by the audit team.

In the case where an auditor might want to review a specific subset of transactions that they feel are potentially misstated, the advanced search function can be used to dive deep in the ledger and select transactions for testing that have been identified as risky under Step 1 and 2 above.

The MindBridge application enables the audit team to:

- Assess the completeness of a ledger
- Customize the rule-based control points depending on client risk-assessment
- Analyze the GL using rule-based and machine learning-based control points
- Dive deep into the data and test specific transactions of concern through its advanced search function
Steps 4 & 5: Test & Document

All of the above information, and results, need to be properly documented and pass the “experienced auditor test” which means an experienced auditor needs to come to the same conclusion when reviewing the audit evidence.

Documentation needs to be compiled that captures:
• The inquiries made
• Unusual activities identified
• Conclusions about controls
• Procedures to assess completeness
• The selected transactions for field testing
• The basis thereof, procedure performed to test transactions
• The conclusions reached

How does MindBridge help?

Through the MindBridge application, the audit team can export a list of all transactions that have been reviewed and selected for further testing. It also includes transactions that have been reviewed and were confirmed as normal business practice in order for senior staff to review.

In order for field staff to perform their inquiries on the transactions, all algorithms that the individual transactions triggered are also included in the export summary.

MindBridge: How Does It Work?

Clustering and Business Process Mining

Every organization has business processes which are typically reflected in their accounts in some way. Each business generates revenue which in a basic example is typically the result of a client purchasing a product or service. This process would be reflected in the finances of the business and the same is true of payroll, expenses and many other more complex business processes. By modeling an organization’s accounts, a machine can find all the processes that impact the finances of a business. More interestingly, in order to cluster and group these processes, the machine does not need to understand them. The machine does this by simply analyzing the monetary flows and understanding which accounts in the ledger participated in the transactions. In order to understand the business process groups, a machine looks for common patterns and repeated interactions.

The association of these groups then forms the basis of more advanced outlier detection and anomaly detection.
Outlier Detection

It is often the case that it is not a single transaction that indicates an anomaly but a group of transactions such as a recurring monthly event. As such, normal outlier detection does not work as it is often a set of transactions that individually may appear to be normal or acceptable practices but collectively do not follow normal or acceptable practices. To address this, outlier detection must be built in several layers to consider the rarity of a given business process and the outlier score of transactions based on other transactions in its group, and the ledger as a whole.

Anomalies such as financial misstatements, or fraud, are often not detected because they are carefully hidden amongst other similar transactions. Sophisticated fraudsters hide their work amongst similar account interactions and values. This is where outlier systems need to consider many dimensions of the data at once. While human beings are good at seeing an outlier in 2 or 3 dimensions, a machine can do the same work tirelessly, considering 10 or more dimensions at a time. This capability helps machines to spot the outliers which are hiding next to normal activity and within an established process.

Expert Systems

A prudent safeguard is always to consult experts. The MindBridge system has been built in collaboration with Audit professionals and has gathered the expertise from multiple experts in the field to augment its ability to identify unusual and incorrect financial patterns. Generating a risk score that combines the “expert analysis” with transaction flow analysis, rules-based systems and machine learning represents a formidable resource in focusing and accelerating the audit process.

Example Use Case: Anomalies Based on Real World Scenarios

Expense Problem: Executive Expenses

In this scenario, a company executive was submitting expense claims inappropriately and the accounting of their credit card expenses was being attributed to accounts in an unusual way. The distribution of the associated amounts and the accounts to which they were being posted to was unusual.

Machine Learning Techniques with MindBridge

The isolation and detection of this anomaly was through the combined results of three MindBridge analytic control techniques.
1. **Rarity** score was **high**. The rarity test was triggered because this particular account interaction did not follow a common expense pattern in comparison with the majority of expense claims in the accounts. While travel expenses were commonly paid out, the second expense account was only used for the purpose of this fraud.

2. **Outlier** score was **low**. The reason outlier was low is that this was a repeating pattern of fraud. Every month the credit card expense was paid so it formed a repeating pattern and was not an individual transaction, hence the outlier score did not rate this transaction highly.

3. **Expert** score was **high**. This was related to the accounts which interacted in the expense payments that were deemed risky because unusual expense payments from cash accounts are considered higher risk.

### Rules Based Techniques

Traditional rules-based techniques may occasionally identify this type of anomalous transaction by “Last 3 Digits” and “Manual Adjustments”, but this would be by chance and unreliable. To meet accounting standards, these types of rule-based tests are performed within the MindBridge platform but they are augmented by machine learning techniques to improve the accuracy in ensuring that these types of transactions are identified.

### Machine Learning Wins

While the expense example described above is quite a simple scenario, it clearly identifies how the MindBridge machine learning techniques can isolate and identify unusual patterns.

Conversely, traditional rule-based approaches may detect either by chance or perhaps after enough time. But, given the volume of normal expense transactions within the dataset, this pattern could have gone undetected for years. While each transaction was below a material limit, once these events are added up over years this could present a significant and material issue. Essentially rules would only catch this scenario by accident.
Demystifying AI – Unlocking the “Black-Box” Syndrome

In history, there have been many occasions when new technologies and innovations have dramatically changed the way that businesses operate which has always been faced with skepticism and reluctance to adopt.

In recent years, the use of analytics or big data has had a major impact in the way that businesses function. As the amount of data grows, figuring out what to do becomes increasingly difficult. The use of analytics can unlock opportunities or threats hidden in mountains of data.

Although AI technology is widely used in many industries, it is new to the audit profession which may appear to be a black-box to the uninitiated, but this will subside as its adoption increases within the auditing community. AI on its own is not the answer. Professional judgement must be a key element of the auditing process.

MindBridge’s approach is to augment the auditors’ capacity with an AI-based platform that combines industry-standard business rules and statistical models, to maintain the assurance of current audit practices, with the enhanced analysis of machine learning algorithms.

MindBridge’s suite of algorithms:

<table>
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<tr>
<th>Algorithms</th>
<th>MindBridge</th>
<th>Increasing Value of MindBridge Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Rules</td>
<td>Packaged library of rules that adhere to industry standards</td>
<td>Meets industry standards to detect known financial misstatements &amp; errors</td>
</tr>
<tr>
<td></td>
<td>• All tests automatically performed</td>
<td></td>
</tr>
<tr>
<td>Statistical Models</td>
<td>Built-in recommended statistical tests</td>
<td>Analysis includes industry recommended statistical model tests</td>
</tr>
<tr>
<td></td>
<td>• All tests automatically performed</td>
<td></td>
</tr>
<tr>
<td>Machine Learning</td>
<td>Built-in proven machine learning tests based on adaptation of proven methodologies</td>
<td>Enhanced analysis with automated machine learning tests to uncover unknown financial misstatements &amp; errors</td>
</tr>
</tbody>
</table>

MindBridge keeps the controls in the hands of the auditors

- Results are used to augment auditors and focus investigations, auditors make final decisions.
- Auditors determine which controls to use and their associated weights in the risk score.

Proven Methodologies

Machine learning/AI have been used in statistics and predictive analytics for years, notable examples include:

- The New York State Tax Authority uses predictive analytics to detect tax refunds.
- PayPal uses predictive analytics to fight payment fraud.
**AI is needed in the Audit profession to handle the complexity of Big Data**

- Limited human capacity to examine all the dimensions of transactions.
- Unlimited capacity of machines to mathematically measure multiple points in many dimensions to identify patterns with a high degree of accuracy.

**Confidence in AI-based solutions in audit will increase with usage**

- ERP systems were also deemed a black box when launched decades ago and are now mainstream.
- Extensive and well planned piloting of the AI provides assurance through firsthand experience.
- Investigation and decision making remain the role of the human auditor.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Traditional Audit Analytics Tools</th>
<th>MindBridge</th>
<th>Winner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coverage of testing</td>
<td>100% of known areas of interest</td>
<td>100% of known and unknown cases</td>
<td>MindBridge</td>
</tr>
<tr>
<td>Proven usage</td>
<td>Trusted, but outdated technology</td>
<td>Breakthrough technology, with growing evidence of its effectiveness</td>
<td>Tie (with MindBridge positioned to surpass)</td>
</tr>
<tr>
<td>Knowledge curve (coding)</td>
<td>100% of known areas of interest</td>
<td>Not required</td>
<td>MindBridge</td>
</tr>
<tr>
<td>Ease of use (user interface)</td>
<td>Cumbersome, requires repetitive, extensive user training</td>
<td>Highly visual, intuitive with little-to-no training</td>
<td>MindBridge</td>
</tr>
<tr>
<td>Template (speed)</td>
<td>Time-consuming to set up rules for each client file</td>
<td>Not required</td>
<td>MindBridge</td>
</tr>
<tr>
<td>Availability</td>
<td>Dependent on ERS resource</td>
<td>Self-service</td>
<td>MindBridge</td>
</tr>
<tr>
<td>Composition &amp; Depth of Algorithms</td>
<td>Rules are hand-crafted scripts and results are logged.</td>
<td>Packaged industry standard rules enhanced with automated, scientific algorithms, results are logged and can be exported</td>
<td>MindBridge</td>
</tr>
<tr>
<td>False-positives handling</td>
<td>Rule must be created to handle each case</td>
<td>Once flagged, machine learning automatically excludes them from future analysis</td>
<td>MindBridge</td>
</tr>
<tr>
<td>Data Ingestion</td>
<td>Manual, labor-intensive</td>
<td>Built-in, automated “smart ingestion” leveraging machine learning</td>
<td>MindBridge</td>
</tr>
<tr>
<td>Adherence to Audit Standards (IAS 240, CAS 240 &amp; SAS 99)</td>
<td>Subjective &amp; selective: reliant on professional skepticism and experience to identify potential financial misstatements</td>
<td>Objective &amp; inclusive: AI risk-based analytic tests prescribed by the Center for Audit Quality, plus extended analysis that further improves audit assurance</td>
<td>MindBridge</td>
</tr>
</tbody>
</table>
About MindBridge

MindBridge is disrupting Financial and Audit markets using artificial intelligence by applying converged analytics to analyze organizational financial transactions. Using algorithms based upon smart data science, MindBridge generates actionable insights through an interactive, user-friendly visual interface to help organizations minimize risk exposure to financial loss while supporting audit firms to meet industry standards. The MindBridge application has been tested by industry leading professionals and is proven to detect anomalous activities and transactions that current incumbent systems cannot.