Analytics to the Rescue: Better Loss Prevention through Modeling

By strategically applying predictive analytics, retailers can be empowered to reduce, if not avoid, loss due to shrinkage.

Executive Summary

Shrinkage, or the unintended loss of revenue, is a major issue in many industries, especially in retail. And with margins narrowing in many industries, preventing these losses is crucial. The types of shrink differ by industry, but common factors stem from human and environmental causes. A comprehensive loss prevention strategy must take these factors into account and mitigate them.

The foundation of a successful loss prevention solution is built on data, analysis and predictive modeling capabilities. The more mature these capabilities are, the more advanced and accurate a business's loss prevention strategy will be. Predictive modeling, in particular, allows organizations to move from a reactive to a proactive stance to preventing loss.

This white paper provides a point of view on how retailers can take a strategic approach to loss prevention by building and applying advanced analytics models to prevent loss or shrinkage. (For more on this topic, see our white paper “Predictive Response to Combat Retail Shrink.”)

The Download on Shrink

Shrinkage in the retail and hospitality industries has a tremendous impact on the bottom line. According to the National Retail Foundation (NRF), total shrinkage in the U.S. hovers at around 1.4% of sales, which translates to $34.5 billion. Since retail margins are historically low, the ability to reduce shrinkage will have a disproportionate impact on a retailer’s bottom line. The same holds true for the hospitality industry. According to the National Restaurant Association, the loss for restaurants is 4% of the total food cost.

Over the past decade, the retail and hospitality industries have taken a variety of approaches to reduce shrinkage:

• Developing better systems to limit loss due to accounting, receiving and ordering.
• Instituting better processes to keep track of receipts, orders and sales, resulting in up-to-date information about shrinkage.
• Training employees to reduce loss due to theft and breakage by ensuring that employees follow proper processes.
• Improving tracking through technologies such as RFID.
• Reducing stock-on-hand via better forecasting.

However, in recent times, these approaches have reached a point of diminishing returns and have not yielded as much improvement as they did a decade ago.
Figure 1 illustrates the many types of shrinkage that impact the retail and hospitality industries.

Across industries, the common denominator for shrink is human behavior. To reduce shrink, then, it is essential to understand the human factor and design solutions that counteract and modify it to the greatest extent possible. Analytics is one of the most important tools for statistically identifying the key factors that are highly correlated with loss due to shrink. Identifying these key factors can allow organizations to classify locations that are likely to have a high incidence of shrink, allowing them to take better preventive actions in a more cost-effective manner.

**Loss Prevention Solution Maturity Model**

The following factors determine the maturity of an organization’s loss prevention efforts:

- **Data**: Data needs to be collected from multiple sources, including point of sale (POS), inventory, receiving and store operation applications. To calculate shrink, data from these sources must be compared.

- **Analysis**: When data is analyzed based on rules, potential shrink can be identified. This analysis can be both manually intensive (when multiple reports are compared) or automated (when reports are generated automatically and discrepancies are algorithmically highlighted).

- **Predictive**: Analytics modeling is used to understand key factors that are highly correlated or play a causal role in loss. This enables organizations to move from being reactive to proactive by understanding the underlying factors, identifying their magnitude at each location and taking action.

Based on our experience, most organizations in the hospitality industry are at the low end of the maturity curve. These organizations still have data in silos, and they approach loss prevention by manually compiling and analyzing reports before they take action.

From what we see in the retail sector, most organizations have built data warehouses containing consolidated data. In addition, many retailers now use automated reporting; a few are using...
predictive modeling to develop loss prevention solutions. However, most retail organizations fall in the middle of the maturity spectrum and have not yet implemented analytical modeling (see Figure 2).

**Using Analytics Modeling for Loss Prevention**

Figure 3 illustrates our methodology for loss prevention analysis.

**A Loss Prevention Methodology**

**Data Discovery**
- Determine data source and execute data collection

**Store Clustering**
- Cluster like stores for modeling purpose based on defined criteria

**Model Development**
- Develop loss prevention model for each cluster

**Insight Development**
- Develop insights from model outputs to score probability of fraud

### Loss Prevention Solution Maturity

The main objective of using analytics modeling for loss prevention is to identify the key factors that contribute to loss. After focusing on these factors, organizations should identify locations in which these factors are most prevalent and devise a strategy to prevent loss. Figure 4 lists the key factors for restaurants and retailers.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Takeout vs. dine-in</td>
<td>1.497</td>
</tr>
<tr>
<td>Bar vs. floor</td>
<td>2.100</td>
</tr>
<tr>
<td>Dinner vs. lunch</td>
<td>1.528</td>
</tr>
<tr>
<td>Employee tenure</td>
<td>1.248</td>
</tr>
<tr>
<td>Median home value</td>
<td>1.222</td>
</tr>
<tr>
<td>Median household income</td>
<td>1.153</td>
</tr>
</tbody>
</table>
Business Situation
A $17 billion discount retailer engaged us to reduce losses due to shrink.

The Challenge
• Revenue leakage due to shrink equaled half the retailer’s net income, which is twice the industry average (see Figure 5).
• Human errors resulted in 60% accuracy, costing millions of dollars.
• The absence of real-time data and analysis resulted in ineffective decision-making.
• Reports lacked a focused correlation among causal factors that were causing shrink, providing little guidance to loss prevention teams on next best actions.
• Even a small reduction in shrink would greatly enhance profitability.

The Solution
• Collaborate with the business side to understand shrink causes and their direct and indirect correlation.
• Identify the vital causal factors; assess the root cause for shrink at the store level and assess its impact.
• Develop an automated process to predict shrink at the store level.
• Develop prototype data model and deploy.
• Conduct a real-time shrink assessment; assess automated shrink at a daily/weekly level.
• Automate root cause analysis and prioritize actions at a daily/weekly level.
• Monitor, modify and roll out to more than 8,000 store locations.

Results to Date
• Completed the prototype phase:
  ➢ Divided 6,586 stores into 15 clusters.
  ➢ Developed a model for predicting inventory overshort for one of the store clusters.
  ➢ Identified key drivers for shrink.
  ➢ Next step: Develop and roll out a solution for all stores.

Estimated and Achieved Benefits
• Increased speed and enabled real-time assessment of shrink and its causes; prediction on a daily basis would help focus on highest risk locations.

Client’s Annual Loss Due to Shrinkage

<table>
<thead>
<tr>
<th>Year</th>
<th>Loss Due to Shrinkage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>$290</td>
</tr>
<tr>
<td>2012</td>
<td>$231</td>
</tr>
<tr>
<td>2011</td>
<td>$190</td>
</tr>
<tr>
<td>2010</td>
<td>$197</td>
</tr>
<tr>
<td>2009</td>
<td>$220</td>
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<tr>
<td>2008</td>
<td>$239</td>
</tr>
<tr>
<td>2007</td>
<td>$236</td>
</tr>
<tr>
<td>2006</td>
<td>$219</td>
</tr>
</tbody>
</table>

Source: Cognizant analysis
Figure 5
Loss Prevention Models

One of the most commonly used analytics models for predicting loss in the restaurant industry is built on logistics regression. This model applies to each transaction. The input for the model can be sales data, store characteristics and other significant factors. The output is a category variable of values 0 or 1, where 0 indicates a minuscule probability of loss, and 1 indicates a high probability of loss.

The model for retail, meanwhile, is based on average loss for a number of transactions over a period of time. Here, the model determines the significant factors and predicts whether a store is likely to have loss in the future.

In both models, key factors that indicate loss are identified. The models reveal the significance of a factor by calculating a probability score. A high probability ratio indicates a high probability that a factor will result in a loss.

Benefits

The main benefit of using analytics is the ability to identify key factors that indicate a higher probability of loss. This allows organizations to monitor those factors and get a sense of probable loss even before they happen, enabling them to take corrective action. Analytics enables proactive steps to manage loss.

An example can be seen in our work with a large restaurant chain to establish a predictive modeling approach. Using analytics, we identified key restaurant, employee and operational metrics that were highly correlated with loss and theft. Based on these factors and analysis of historical transactions, stores in which loss was more likely to happen were identified, and processes were instituted to prevent loss and theft. In total, we identified potential savings of $2 million, or approximately 1% of its cash transactions.

We are also using predictive models in our work with a discount retailer to identify opportunities for reducing its loss prevention operations cost by 50% (see sidebar, page 4). We are focusing its staff on the top 10% of the stores that are more likely to incur more than 70% of the loss. Using predictive modeling, we have also improved the retailer’s shrinkage accuracy by 85% based on daily analysis. Before, its shrinkage calculations were performed manually, and the accuracy was less than 50%.

Moving Forward

The benefits of using analytics for loss prevention have proved to be significant. Retailers and restaurants have identified key factors and taken corrective actions, as appropriate. Using analytics, organizations can be proactive rather than reactive to loss prevention.

Footnotes


About the Author

Sujit Acharya is an Associate Principal within Cognizant Analytics. An analytics and data professional with strategy and execution proficiency, Sujit has in-depth experience developing data-driven growth and operational strategy, leading to significant growth and operational improvements for clients in the retail, CPG, manufacturing and travel/hospitality industries. In addition, he has deep expertise developing products and organizations to operationalize data-driven strategies and deliver distinct market advantages to clients. Sujit also consults on advanced analytics models and enablement across large organizations. He has an M.B.A. from the Booth School of Business and an undergraduate degree in engineering from IIT, Varanasi, in India. He can be reached at Sujit.Acharya2@cognizant.com.

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