Case Study

Optimizing Federal Worker's Compensation Claims Approval

Elder Research developed a data-driven risk assessment framework to fast-track Worker's Compensation claims, avoiding manual review and adjudication. Claims that are routed to the fast track are assigned risk-based maximum payment limits for intelligent ongoing claims management.

INDUSTRY

» Insurance

BUSINESS NEED

» Reduce claims examiner workload and minimize improper claim processing

SOLUTION

» Performed extensive data cleaning and compression to improve model accuracy

» Built, tested, and validated a risk assessment framework comprised of five models to optimize routing of claims

» Created a dynamic application to enable users to modify model parameters and observe the expected outcome

BENEFIT

» Decrease improper payments

» Enable examiners to prioritize time spent on complex claims

» Faster claims approval for many claimants

The Challenge

The U.S. Department of Labor's Federal Employees' Compensation Act (FECA) is a highly cost-effective self-insurance system that provides workers' compensation coverage to three million Federal and Postal workers. FECA processes approximately 115,000 new cases each year, and Short Form Closure (SFC) is a process used to electronically filter claims for either automatic acceptance or routing to a claims examiner for review. The process seeks to reduce claims examiner workload while minimizing improper claim behavior. Because there is no human review of claims that remain in SFC, there is a risk of improper payments, acceptance, or management of these claims. Elder Research was engaged to amend the set of SFC rules to increase efficiency in the claims examination process and minimize risk from claims left in SFC by achieving the following goals:

1. Maximize the total number of claims permanently routed to Short Form Closure (SFC).
2. Minimize the number of claims temporarily routed to SFC and subsequently "flipped" open.
3. Decrease the number of claims sent to SFC that would have been denied in manual adjudication.
4. Formalize the notion of "risk" and reduce FECA's total exposure to "risk" in the subset of Short Form claims which are never seen by claims examiners.

The Solution

The current SFC claim routing is determined by a rules-based filter that captures about 44% of claims into SFC annually. Thirty-four percent (34%) of incoming cases are filtered out of SFC on initial entry, while an additional 22% are removed from SFC due to actions taken after the case opening (e.g., additional bills cause the case to exceed the $1,500 cap on medical costs). The structure of this process is summarized in Figure 1 below.

To improve upon this system, Elder Research combines some of these rules with a risk scoring and minimization algorithm. First, models are created (using more than 590,000 historical FECA cases) to predict the outcome of each case based on the

Contact Us
www.elderresearch.com
contact@elderresearch.com
(434) 973-7673

ELDER RESEARCH
DATA SCIENCE · AI · MACHINE LEARNING

Office Locations
Charlottesville, VA
Washington, DC
Baltimore, MD
Raleigh, NC
London, UK

characteristics of a case known at the time a claim was submitted. These outcomes include:

- The probability that a case would be denied upon manual adjudication
- The total medical costs expected for the case
- The probability that the claim would apply for wage loss benefits

A routing determination is then made for each case, based on the risk established by the predictions. If a claim fits certain core rules from the old system, the model predicts the probability that the claim would be denied in manual adjudication. If the claim has a sufficiently high denial probability, it is rejected from SFC. Otherwise, the claim is assigned a medical amount cap between $500 and $3,000 based on the denial probability (higher denial risk leads to a lower cap). Then the claim is evaluated for its propensity to exceed that threshold or claim wage loss benefits. If the probability of these combined events exceeds 50%, then the claim is rejected from SFC and manually adjudicated. Otherwise the claim is tentatively accepted through SFC. If at any time the cap amount is exceeded or wage loss is claimed, then the case is adjudicated manually at that time. (This process is more difficult after the claim has been accepted so such cases are minimized.) This process is shown in Figure 2.

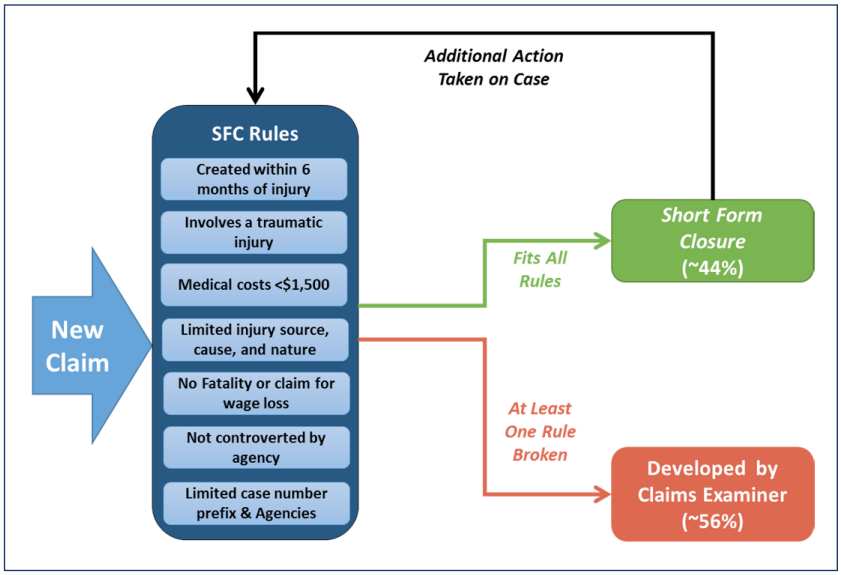

Figure 1. Current SFC rules-based filter process

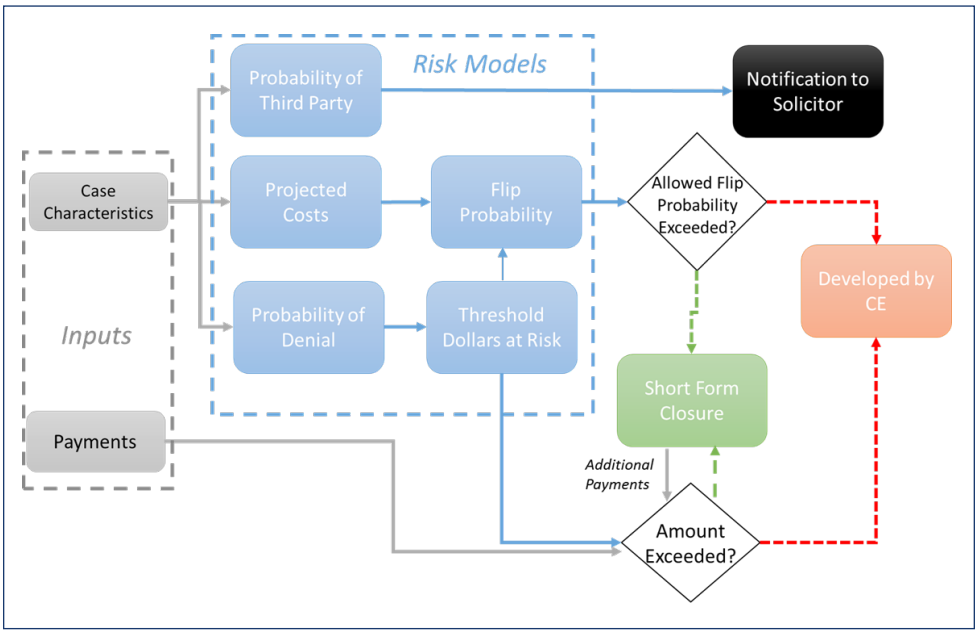

Figure 2. Risk model decision framework

The solution includes configurable metrics (e.g., the Projected Cost threshold, Flip Probability threshold, etc.) to allow FECA to make tradeoffs in the expected risk outcomes. For example, if FECA becomes more concerned about flipped claims (initial acceptance followed by a case exceeding its dollar cap), then it can accept cases into SFC only if their chance of exceeding the cap is under 80%. This tradeoff would reduce the occurrence of flipped claims, though at some cost to other metrics.

The data cleaning, feature creation/selection, machine learning, ensemble, and calibration methods for each model were optimized for a specific metric. For example, the Denial of Claim model seeks to predict which cases will end in a denial after initial adjudication. According to this risk model, only 6.6% of the least risky 5,000 claims in a given year will be denied. Conversely, 81.8% of the 5,000 riskiest claims will be denied—about 12 times

Contact Us
www.elderresearch.com
contact@elderresearch.com
(434) 973-7673

ELDER RESEARCH
DATA SCIENCE · AI · MACHINE LEARNING

Office Locations
Charlottesville, VA
Washington, DC
Baltimore, MD
Raleigh, NC
London, UK

the denial rate of the low risk claims and over twice the overall denial rate.

One of the challenges of this project was establishing a baseline denial rate for current SFC cases given that no humans actually review these cases—making it difficult to measure the effectiveness of the new system. Elder Research implemented the use of a small holdout sample of claims from SFC. Each case in this "control sample" will be reviewed by claims examiners whether or not the risk engine determines that it should be sent to SFC. This will allow FECA to observe, for a small but representative sample, what proportion of claims are denied by an examiner despite being recommended for SFC.

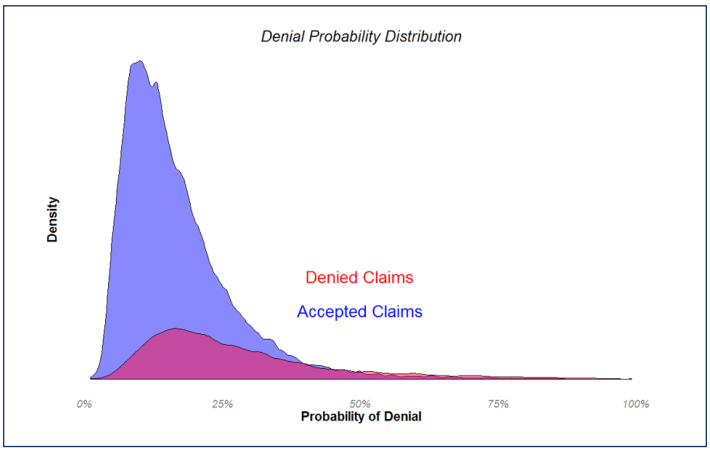

Figure 3. Stacked distribution of risk scores for denied and accepted claims

Results

At the conclusion of the project, Elder Research outlined the expected outcome based on all of metrics considered. A dynamic application was created allowing users to input their own parameters and view the expected outcome. The results relied on estimates for some claim costs and other input information that was not available in the data set. An example of expected outcomes is shown in the table below (where better results are green and worse are red):

Metric	Est. Model Outcome	Est. Current Value	Improvement
Total claims that remain in SFC	56,600	52,000	+ 9%
Number of Flips	13,500	22,000	- 39%
Number of Denials Missed	11,600	8,800	+ 32%
Total Medical Amount of Missed Denials	$1.8 Million	$2.4 Million	- 25%
Total Medical Amount in SFC	$15.8 Million	$16 Million	- 1%
Additional Thrid Party Claims Reported/ Opened	N/A	723	N/A

The expected outcomes are a considerable performance improvement over the previous routing system. The one exception is that the number of missed denials increases, which may weaken the deterrent effect of claim examiner review. However, the total amount lost to these denials is expected to decrease, while the total number of claims sent to SFC is expected to increase. Thus, this system will reduce improper payments for a known reason (i.e., denials sent to SFC) and will allow examiners to spend more time managing more complex claims to reduce other types of improper payments. Claims examiners can use the risk models to prioritize complex cases and distribute case load more effectively (i.e., experienced examiners could take higher risk claims).

The risk models also aid knowledge transfer in key ways:

1. Insights uncovered in the models could document, in a systematic and verifiable manner, some of the trends and "tribal knowledge" that examiners have gained through their experience, and this information could be used to provide training material to new examiners.
2. Risk scores could be simplified into risk groups (low-medium-high) and passed on to the claims examiner. This could be done for each risk metric or based on a weighted combination.

Contact Us
www.elderresearch.com
contact@elderresearch.com
(434) 973-7673

ELDER RESEARCH
DATA SCIENCE · AI · MACHINE LEARNING

Office Locations
Charlottesville, VA
Washington, DC
Baltimore, MD
Raleigh, NC
London, UK