Predictive Modeling from a Risk Management Perspective
David P. Duden
Director
Deloitte Consulting
Hartford, CT

Eric Oldroyd
Group Manager
Target Corporation
Minneapolis, MN
Objectives for today’s meeting

Objectives:

1. Understand the current market for Predictive Modeling
2. Understand the purpose and benefits of Predictive Modeling for Risk Managers
3. Understand some of the unique applications
4. Discuss Case studies
Agenda

Overview of the Current Marketplace

Overview of Claims Predictive Modeling

Important Features of Predictive Models

Business Application Discussion

Potential Challenges

Results

Questions & Answers

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What are some of the responses we are seeing today?

<table>
<thead>
<tr>
<th>Current Challenges</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency / Severity</td>
<td>Leakage Studies</td>
</tr>
<tr>
<td>Fraud</td>
<td>Process Re-engineering</td>
</tr>
<tr>
<td>Assignments and Reassignments</td>
<td>Legacy System Replacement</td>
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<tr>
<td>Medical Inflation</td>
<td>Outsourcing of Transactional Activities</td>
</tr>
<tr>
<td>Changing Demographics of the Workforce</td>
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<tr>
<td>Legislative Reform &amp; Litigation</td>
<td>Advanced Analytics and Claims Predictive Modeling</td>
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<tr>
<td>Educational Campaigns</td>
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<tr>
<td>Financial Results Under Pressure</td>
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</tbody>
</table>

- Claim Assignment
- SIU Management
- Medical Case Management
- Escalation
- Litigation Management
- Subrogation

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What differentiates claims organizations?

“If we want to make better decisions and take the right actions, we have to use analytics. Putting analytics to work is about improving performance in key business domains using data and analysis.”

- Tom Davenport, author of Analytics at Work: Smarter Decisions, Better Results

Analytical champions
Lead analytical initiatives

Analytical professionals
Can create new algorithms

Analytical semiprofessionals
Can use visual and basic statistical tools, create simple predictive models

Analytical amateurs
Can use spreadsheets and use analytical transactions

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What is happening in the Insurance market around Claims PM?

Gartner
August 30, 2011 Hype Cycle for Analytics Applications, 2011

“Business Impact: P&C insurers using claims analytics will gain better insight into their claims operations, including the impact of claims servicing on customer retention, the cost of claims handling, process bottlenecks, and better financial intelligence to identify leakage and losses. Greater insight will give claims managers the ability to run their units effectively and make a better contribution to corporate profitability and operational efficiency. The biggest benefit will come from using these tools to view claims adjusters' work performances and to see who is opening claims, the type of claim, the amount of reserve and the time to close, which will enable claims managers to be better at fraud management overall.”
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Predictive modeling helps organizations achieve their claims objectives

- More effectively control costs and LAE through improved operational efficiency
- Strengthen competitive position

Potential Strategies to Achieve Objectives

- Improve claim outcomes by implementing PM
- New product development
- New forms of distribution
- Workforce planning

Objectives

Actions

- Identify claims that have the potential to be more severe in exposure. Conservatively, the worst 20% of claims represent almost 80% of total loss costs
- Match claim complexity with appropriate claim resources at First Notice of Loss (FNOL)
- Use medical management more efficiently to provide timely and appropriate medical care to return claimant to work sooner
- Identify potential fraud earlier
- Identify claims with potential for subrogation earlier
- Identify potential litigation earlier
- Identify changes in claim activity that warrant earlier escalation
- Identify claims requiring oversight
- By doing all of the above, organizations can help claimants get better faster, and could reduce overall claim costs

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Model Types

Severity Model at FROI and Through Time Severity Model
(Medical only, lost time – medical portion, lost time – indemnity)
- Targets core business - overall workers’ compensation claim management
- Segments high severity claims from low severity claims, enabling activities that will drive loss costs down
- Multiple business applications maximize short-term business impact (e.g., auto adjudication, fraud, medical case management)
- Data acquisition and implementation supported by broader business case

Litigation Model
- Model targeting the identification of claims with a propensity for litigation (i.e., chance of a case going to litigation)
- Assists in case assignment and development of litigation management strategies
- Considers additional data sources (internal and external)
- Opportunity to leverage legal bill data and system

Subrogation Model
- Model targeting the identification of claims with subrogation potential
- Improves timeliness and quality of subrogation referrals
- Leverages data acquisition and variable creation from prior models

Fraud Propensity Model
- Model targeting the identification of claims with potential for hard or soft fraud
- Improves timeliness and quality of fraud referrals
- Leverages data acquisition and variable creation from prior models
- Incorporates additional information that may not predict severity but that may be a predictor of fraud (e.g. Employer is suspicious of claim)
PM helps organizations target high exposure claims

- When a claimant’s injury is a sprained back, there is a wide and varying distribution of claim outcomes
- **The worst 20 - 30% of claims contribute to 70 - 80% of loss costs**
- PM uses a variety of data sources and analytics techniques to enable organizations to predict which claims are most likely to be the worst claims
- The graph below shows the varying distribution in total lost days for back sprain injuries:
Data from traditional and non-traditional means used to predict outcomes

By combining internal data with external data from a number of sources, enhanced segmentation can be achieved. External data can also provide an early indication of existing co-morbidities.

<table>
<thead>
<tr>
<th>Claimant Data</th>
<th>External Public Databases</th>
<th>Medical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Claimant Specific Information</td>
<td>• Zip Code Demographic</td>
<td>• Medical History</td>
</tr>
<tr>
<td>• Diagnosis Information</td>
<td>• Household Demographic</td>
<td>• Treatment History</td>
</tr>
<tr>
<td>• Years of employment</td>
<td>• Claimant</td>
<td>• Treating Physician</td>
</tr>
<tr>
<td>• Type of work</td>
<td>• Medical</td>
<td>• Diagnosis Information</td>
</tr>
<tr>
<td>• Job level</td>
<td>• Legal</td>
<td>• Treatment Patterns</td>
</tr>
<tr>
<td>• Average weekly wage</td>
<td></td>
<td>• Prescription Usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Co-morbidities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Claims Data</th>
<th>Policy History Data</th>
<th>Employer Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Losses</td>
<td>• Experience Data</td>
<td>• Financial Stress</td>
</tr>
<tr>
<td>• Timing/Patterns</td>
<td>• Policy Data</td>
<td>• Years in Business</td>
</tr>
<tr>
<td>• Settlement Data</td>
<td></td>
<td>• Public Record Filings</td>
</tr>
<tr>
<td>• Jurisdiction</td>
<td></td>
<td>• Loss Control Data</td>
</tr>
<tr>
<td>• Fraud/Lawsuit</td>
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Traditional and non-traditional characteristics can be predictive

Insights can be revealed through both traditional and non-traditional risk characteristics. Even use of a relatively small set of predictive variables can enhance claim segmentation.
PM uses many sources of data to identify potential high exposure claims

PM combines and converts available internal and external claim characteristics into a score with corresponding reason messages. This output reflects and explains the potential exposure of the claim and assists with ensuring the right resources are assigned to the right claims.

**Model Inputs**

Several hundred internal and external characteristics are tested to identify the 50-100 with greatest predictive power

**Data Mining & Statistical techniques**

**Sample Model Equation**

\[ w_1(\text{Claimant Age}) + w_2(\text{Dist}_H\_W) + w_3(\text{Emerg}_\_Rm) + w_4(\text{Occupation}) + w_5(\text{CoMorbidity}) + w_6(\text{Report}_\_\text{lag}) + \ldots \]

**Model Outputs**

92

John Smith
1 Circle Ave.
Anytown, NY

**Reason Messages:**
- Multiple co-morbidities
- Claim history
- Employment characteristics
- Distance from work

**Claim Segmentation Curve**

- **High Exposure**
  - (Refer to senior adjuster, SIU, Nurse)
  - Assign to seasoned adjuster
- **Assign to entry level adjuster**
- **Auto-adjudicate**

**High Exposure**

- **Assign to seasoned adjuster**
- **Assign to entry level adjuster**
- **Auto-adjudicate**

**Low**

**Claim Complexity**

**High**

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PM output can assist with initial assignment

The combination of traditional injury information with predictive model outputs provides a more accurate segmentation of claims to enable them to be routed to the most appropriate assignment tier and specialty resources at First Notice of Loss.

<table>
<thead>
<tr>
<th>Traditional Approach</th>
<th>PM Enabled</th>
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<tbody>
<tr>
<td><strong>A. Back Strain; 44 year old Heavy Machine Operator; Slip &amp; Fall</strong></td>
<td></td>
</tr>
<tr>
<td>- Injury based assignment – <em>Claim routed to TIER 2</em></td>
<td></td>
</tr>
<tr>
<td>- Model Score of 87; reason messages indicate high severity due to claims history, accident characteristics – <em>Claim routed to TIER 4 with SIU referral</em></td>
<td></td>
</tr>
</tbody>
</table>

| **B. Lower Leg Fracture; 28 year old Clerical Worker** |
| - Injury based assignment – *Claim routed to TIER 4* |
| - Model Score of 22; reason messages indicate low exposure due to lack of co-morbidities – *Claim routed to TIER 2* |

| **C. Knee Contusion; 56 year old Forklift Operator; Med-Only Claim** |
| - Medical-Only based assignment – *Claim routed to TIER 1* |
| - Model Score of 91; reason messages indicate high exposure due to claimant requiring ambulance and surgery – *Claim routed to TIER 2 with nurse referral* |

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Output can assist with ongoing investigation, use of specialty resources

First Notice of Loss Summary
- The claimant, who was a four year employee, worked as a heavy machine operator.
- The claimant (44 years old) suffered a back strain after a slip and fall.
- Return to work date unknown.
- Employer did not question legitimacy of claim.

Translating Model Outputs
- High claim severity score indicates need for experienced claim resource
- Prior loss history prompted review of past claims with handling adjusters prior to initial claimant contact
- Model score, claim history, accident characteristics, and distance variable triggered an automated SIU referral

Business Actions
- Assignment to senior claim adjuster
- Adjuster took the claimant’s recorded statement to document the accident and injury details
- SIU Investigator screened and accepted case referral
- When initiating contact at the claimant’s residence, the investigator was referred to a nearby bar operated by a friend of the claimant
- Claimant was observed working and, once questioned, indicated he would withdraw the claim

Results
- SIU field investigation revealed claimant was not disabled
- The claim was denied with no payouts made
- No additional follow up by the claimant or attorney
Why use predictive modeling?
Why use predictive modeling?
Agenda

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A Predictive model enables multiple business applications

Predictive models prospectively identifies adverse claims to enable proactive management strategies across all areas of a claim to drive better business results.

- Deliver high quality service
- Connect to customers and agents
- Ensure quality medical care

- Pay the right amount
- Ensure appropriate return to work for all injured workers
- Accelerate the claims life cycle

- Improve process and operational efficiency
- Properly match skills with work

- Improve reserve accuracy and consistency
- Enhance regulatory and corporate compliance

- Leadership vision and commitment
- Organizational readiness to execute

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Deloitte’s injury group methodology enables greater segmentation

Deloitte’s proprietary Injury Group methodology* categorizes claims based on the injured body part and nature of injury. Injury Groups are then factored into the model to provide enhanced segmentation.

- Deloitte’s Injury Management models are “normalized” by injury group
  - Segments claims within like injuries
  - Allows other severity driving characteristics to come through
- Scores help identify high exposure claims even within those injury groups that typically have lower average cost
  - Model uses signals other than type of injury and body part to identify high exposure claims

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End-to-end integration of predictive models

A proven methodology for successfully implementing predictive models into the business

<table>
<thead>
<tr>
<th>Implementation Phase</th>
<th>Description</th>
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</table>
| Strategy Formation                | ▪ Review and assess the Algorithmic Solution business applications relative to the organizations unique business model and operating environment  
▪ Conduct interviews and workshops with key stakeholders to define the future state vision from a process, technology and organizational perspective |
| Process Assessment                | ▪ Document the detailed current state claims handling processes and system flows  
▪ Determine future state process / system flows for all business applications touched |
| Learning & Development / Communications | ▪ Developing and executing a deployment strategy communication and training plan for the roll-out of the Algorithmic Solutions  
▪ Development of training documentation for claims personnel |
| Deployment Strategy               | ▪ Developing an approach for performance management for measuring and monitoring progress toward initiative objectives, including reporting solution and metric design  
▪ Monitoring model performance and collecting feedback from adjusters |
| Testing Preparation & Execution   | ▪ Developing a functional testing work plan and conduct functional testing  
▪ Developing an approach for performance management for measuring and monitoring progress toward initiative objectives, including reporting solution and metric design |
Collaboration is Key to Implementation Success

• Joint effort to gather data, design model, establish business operational rules, and create technology-sharing solution

• Each party is key ingredient in solution with each receiving benefits of success
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Questions & Answers
Develop Operational Business Rules to Ensure PM Success

- Map out current claim management process
- Identify key areas where additional insight into claim severity would direct different procedures for management of claim
- Categorize risk levels and drivers that would lead to additional or reduced actions
- Consider likely claim volumes under each scenario to ensure volumes and resources are aligned
Predictive modeling provides claim organizations with insight needed to improve their claim management process. Key business applications include resource assignment, investigation, oversight, SIU and medical management to help return the claimant to work and reduce overall loss costs.

Predictive Modeling can impact many areas of the claims handling process

Legend
- Claim Management Process
- PM business application creates significant opportunity for improvement
- PM business application creates additional opportunity for improvement

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Claim severity can be matched to adjuster skill level

Key Benefits

- Enable low complexity claims to be processed in a low touch unit
- Enable claims severity to be matched to adjuster skill level
- Enable supervisors to focus on high severity claims or adjuster skill gaps
- Provide adjusting resources with additional insights into the claim
- Reduce overall return to work times through more targeted investigation and strategies

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Model output can provide an early indication of the need for SIU investigation

**SIU Management**

- **Loss Event** → **First Report of Injury** → **Triage** → **Assign Claim** → **Investigate/Evaluate** → **Establish Reserves** → **Escalation?** → **Manage Claim** → **Issue Payments** → **Close**

**Key Benefits**

- Enable higher quality and more timely referral of claims to SIU resources
- Provide SIU resources with additional information to help guide their investigation early in the process
- Reduce the impact of soft and hard fraud through early detection and deterrence

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Medically complex claims can be directed for medical attention at an early stage

**Medical Management / RTW**

- **First Report of Injury**
- **Triage**
- **Assign Claim**
- **Investigate/Evaluate**
- **Establish Reserves**
- **Escalation?**
- **Manage Claim**
- **Issue Payments**
- **Close**

**Key Benefits**

- Enable medical resources to be placed on the most medically complex claims, regardless of Injury Group or lost time / medical only status
- Manage the utilization of medical resources to focus on claims most in need of these services
- Provide medical resources with more capacity for undertaking return to work duties to help return injured workers to work faster

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Management and supervisory oversight can be targeted towards the highest exposure claims

**Oversight**

- Loss Event
- First Report of Injury
- Triage
- Assign Claim
- Investigate/Evaluate
- Establish Reserves
- Escalation?*
- Manage Claim
- Issue Payments
- Close

**Claim Model**

- SIU Investigation
- Subrogation / Salvage
- Litigation Management
- Medical Management / RTW

**Key Benefits**

- Enable increased management oversight on the more complex claims
- Allow supervisors to monitor individual adjuster inventory based on potential severity
- Draw early leadership attention to claims with a potential to become significantly more severe

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# Agenda

- Overview of Current Marketplace
- Overview of Claims Predictive Modeling
- Important Features of Predictive Models
- Business Application Discussion
- Potential Challenges
- Results
- Questions & Answers

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Tool
Data
Change
Recalibration
Agenda

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Clients are realizing significant benefits from our claims predictive models

Workers’ Compensation models for claim operations are designed to help injured claimants return to work sooner, with reduce loss costs.

**Claim Routing & Assignment**
- Right claim, right resource
- Improve routing to auto-adjudication
- Increase triage consistency through automation

**Fraud Detection**
- Reduce lag time of SIU referrals
- Improve mix of claims referred to SIU
- Deterrence of “soft-fraud”

**Projected Business Impact**

<table>
<thead>
<tr>
<th>4-8% reduction in loss and expense</th>
<th>5-10% improvement in SIU managed claims</th>
<th>3-7% improvement in nurse managed claims</th>
<th>20-25% redeployment of supervisory resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Range of Savings for Clients</td>
<td>WC Spend</td>
<td>Savings Per $100M Of WC Spend</td>
<td></td>
</tr>
<tr>
<td>4% – 8%</td>
<td>$100M</td>
<td>$4M</td>
<td></td>
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</table>

**Medical Management**
- Prompt assignment of nurses on those cases that need it most
- Integrate behavior issues into nurse assignment
- Cost effective use of field case management

**Top Line Growth**
- Demonstrated ability to close claims faster and cheaper leads to competitive market advantage
- Improved client satisfaction strengthens the relationship and brand

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The impact of our models is clear to our clients

“We also, a couple of years initiated a very sophisticated predictive model for assessing our claims activities. It used to take us six months to identify a claim, which had the potential for soft fraud, at which point we put our best adjuster on it. It now takes us 17 days and it's coming down to lower than 17 days as the predictive model proves more successful. So we’re managing our loss costs much more effectively, particularly in lost time, but also in medical, than we have in the past.”

John Degnan, COO, Chubb Corp.
Questions to answer about effectiveness of Predictive Modeling

1. Is model behaving as expected by segmenting claims into appropriate severity buckets?
   • Determine severity results relative to scores generated by model
Questions to answer about effectiveness of Predictive Modeling

2. What impacts are we seeing on claim management tool utilization rates?

- Reduced utilization of nurse case management, giving more confidence that using in right cases

- Earlier referrals to special investigation unit, but not increased usage overall
Questions to answer about effectiveness of Predictive Modeling

3. How have overall claim management success metrics been impacted?
   • Use claims from pre- vs. post-implementation of model to make comparison
   • Recognize that other initiatives/process changes may also impact results

<table>
<thead>
<tr>
<th>Metric</th>
<th>Change Observed</th>
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<tbody>
<tr>
<td>Medical Only to Indemnity Conversion</td>
<td>Down 20%</td>
</tr>
<tr>
<td>Claim Closure Rate</td>
<td>Up 2%</td>
</tr>
<tr>
<td>Average Incurred Cost per Claim</td>
<td>Down 13%</td>
</tr>
</tbody>
</table>
Lessons Learned

• Do things differently!
• Change business rules and processes when you discover a better way
• Sell strategy to numerous levels and roles within each organization
The Future

• Continue to look for new insights
• New applications
• Increase safety, recoveries, use of resources
• Attack Frequency
• Apply to all elements of Risk Management
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