Big Data and Analytics in Insurance
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Frank Diana, TCS
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Matthew Josefowicz is a partner and the managing director of Novarica. He is a widely-published and often-cited expert on insurance technology, operations, and e-business issues who has presented his research and thought-leadership at numerous industry conferences. Over the past decade, he has worked directly with dozens of US and international insurer CIOs to advise them on IT strategy and solution selection, and has written more than 100 reports on insurance technology issues. He is also the lead moderator of the Novarica Insurance Technology Research Council. Prior to launching the insurance practice at Novarica, he founded the global insurance group at analyst firm Celent and led it for more than six years. His other experience includes hedge fund D. E. Shaw & Co., LP. He holds a B.A. *magna cum laude* from Brown University. He can be reached directly at mj@novarica.com.
Frank Diana, TCS

Frank Diana has 29 years of organizational leadership experience in technology and general management. He is currently leading the digital and analytic efforts for TCS Global Consulting. Prior to joining TCS, Mr. Diana led a business analytics growth initiative for enherent Corp., and managed the development of a social computing and advanced analytics platform at Aelera Corporation, where he served as Chief Product Officer. Mr. Diana served as CEO of Traxian, Inc, a software start-up focused on the B2B enablement of small and mid-sized businesses, and as Chief Technology Officer of Fujitsu Consulting focused on software as a service, web service strategies, open source technologies, Web 2.0, eProcurement and B2B communities. He began his career at AT&T, holding various senior roles including CIO for the company’s international financial operation. Mr. Diana also sat on various industry steering committees focused on the development of XML-based data standards. He holds a Bachelor of Science degree in computer science from Rider College. Mr. Diana can be reached by email at fdiana@verizon.net
Agenda

• Big Data: Overview and Vision
• Current State
  Novarica Research
  Big Data Use Cases
• Considerations for the Future
Big Data Overview & Vision
The Excellence Imperative

Relationship-Based and Prescriptive

Collaboration Excellence

Analytic Excellence

Actionable Intelligence

Sustained Competitive Advantage
Big Data and Analytics Form the Core

Big Data
Social
Sensors
Mobile
Traditional
Big Data and an Emerging Architecture

Enterprise

- Systems of Record
  - ERP
  - CRM
  - ECM
  - LOB Applications

- Employees

- Front End Applications

- Systems of Engagement

- Social Intranet
- App Stores
- Mobile Apps
- Mobile Devices
- Web Apps
- User Profiles

- Enterprise Social Networks
- Unified Communications
- Social Business Apps
- Listening

External Stakeholders

- Customers
- Other Stakeholders
- Third Parties

Big Data

Role:

- Inform Operations
- Drive Intelligent Processes

Provides:

- Broader Base of Insight
- Context Awareness
- More Analytic Precision

Value Ecosystem
**Analytic Applications**: The right combination of analytic methods, Traditional BI, data, and knowledge in the context of business process, and in a way that delivers intended business outcomes.
Analytic Application Example

Fraud Mitigation
Business Outcome Framework

- People
- Process
- Technology

Data → Actionable insight → Enabled Actions → Business Outcomes

Outcome Mapping

Insight Mapping

Data and Analytics Mapping
Big Data Current State
Summary of Novarica Big Data and Analytics Research 2012

- General hype about Big Data is refocusing insurers on analytics, but relatively few insurers are currently capturing, analyzing and gaining insight from Big Data.

- While analytics usage is widespread for actuarial and pricing, fewer than half of insurers use analytics to improve operational areas like sales, marketing, or optimized work assignment for underwriters or claims adjusters.

- Larger property/casualty insurers universally plan to embrace analytics across all financial and risk management areas (as well as most operational areas)

- More than a quarter of insurers are using or plan to use Internet clickstreams, audio data, mobile geospatial data, telematics data, or social media content for analysis. Far less common is current usage of mobile data, historical stock market data, video data, or sensor data.

- While few companies currently use Social Media content in their analytics, close to half of all respondents are currently or planning to do so for marketing.

- Relatively few insurers capture, persist, and analyze Big Data within their computing environment today, but those that do typically leverage traditional computing, storage, database and analytics. Very few insurers have invested in specialized Big Data infrastructure, but a significant minority (15-30%) is planning to do so within the next 12 months.

- In general, Big Data is not yet a big priority in most insurance organizations. Most carriers are still maturing and expanding their use of traditional data analytics and predictive models to improve processes, reduce losses and generally improve their book of business.
Usage of analytics in actuarial modeling and risk analysis, pricing and product development is very high, operational analytics are less common. Larger insurers are more advanced than smaller ones.

### Areas of Analytics Usage by Insurers

<table>
<thead>
<tr>
<th>Area</th>
<th>Percentage of Insurers in Sample Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuarial Modeling and Risk Analysis</td>
<td>Used extensively: 71%</td>
</tr>
<tr>
<td>Pricing</td>
<td>Used extensively: 56%</td>
</tr>
<tr>
<td>Producer Management</td>
<td>Used extensively: 34%</td>
</tr>
<tr>
<td>Product Development</td>
<td>Used extensively: 33%</td>
</tr>
<tr>
<td>Agent Compensation</td>
<td>Used extensively: 17%</td>
</tr>
<tr>
<td>Lead development/ Cross Selling</td>
<td>Used extensively: 12%</td>
</tr>
<tr>
<td>Claims Triage</td>
<td>Used extensively: 9%</td>
</tr>
<tr>
<td>Workload Optimization Analysis</td>
<td>Used extensively: 8%</td>
</tr>
<tr>
<td>Underwriter Assignment</td>
<td>Used extensively: 5%</td>
</tr>
</tbody>
</table>
Increased use of analytics has led to increased use of predictive models

- **Underwriting risk score**, in which the analysis of multiple factors results in a single score to help underwriters evaluate prospective risk. Underwriting risk scores can be used to drive automated underwriting or provide a threshold at which risks must be reviewed by a human underwriter.

- **Profitability models**, looking at a risk, book of business, or channel, given underwriting, pricing, loss history, consumer information and/or other factors.

- **Financial projections**, which predicts the financial performance (revenues, operational costs, loss costs and more) of the company or line of business.

- **Stochastic modeling**, a statistical modeling technique that assesses large samples of historical and predictive data to develop probabilities of events occurring, such as claims or fraud.

- **Claims severity** and **fraud** scoring which help adjusters predict the probable severity of a claim and its likelihood of being fraudulent. As with underwriting risk score, claims scoring can be used to drive automated decisioning around claims.
Large property/casualty insurers are more advanced in the use of analytics, but even among them, fewer than half use analytics effectively in operational areas. However, nearly all large insurers are planning to deploy analytics in these areas.

**Current Analytics Usage by Property/Casualty Insurers**

<table>
<thead>
<tr>
<th>Service</th>
<th>Percentage of Insurers in Sample Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss Reserving</td>
<td>76%</td>
</tr>
<tr>
<td>Frequency and Severity Prediction</td>
<td>67%</td>
</tr>
<tr>
<td>Premium Audit</td>
<td>57%</td>
</tr>
<tr>
<td>Settlement</td>
<td>48%</td>
</tr>
<tr>
<td>Fraud, Detect Unknown Patterns</td>
<td>48%</td>
</tr>
<tr>
<td>Adjuster Assignment</td>
<td>43%</td>
</tr>
<tr>
<td>Litigation Management</td>
<td>43%</td>
</tr>
<tr>
<td>Claim Service Prioritization</td>
<td>43%</td>
</tr>
<tr>
<td>Subrogation</td>
<td>43%</td>
</tr>
<tr>
<td>Fraud, Early Warning Indicators</td>
<td>43%</td>
</tr>
<tr>
<td>Fraud, Indentify Rings</td>
<td>43%</td>
</tr>
<tr>
<td>Anomaly Detection Models</td>
<td>38%</td>
</tr>
<tr>
<td>Fast Track Identification</td>
<td>29%</td>
</tr>
</tbody>
</table>

- **Large PC (n=21)**
- **Midsize PC (n=48)
Current usage rates of most “Big Data” elements are still quite low, with the exception of geospatial data.

### Expected Data Source Usage by Insurers

*(n=86)*

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Already Using This</th>
<th>Definitely</th>
<th>Probably</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geospatial data</td>
<td>29%</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td>Internet clickstreams</td>
<td>12%</td>
<td>6%</td>
<td>13%</td>
</tr>
<tr>
<td>Audio data (e.g. voice recordings)</td>
<td>10%</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td>Historical stock market data</td>
<td>8%</td>
<td>2%</td>
<td>12%</td>
</tr>
<tr>
<td>Social-media content</td>
<td>5%</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>Mobile data/geospatial information</td>
<td>3%</td>
<td>10%</td>
<td>21%</td>
</tr>
<tr>
<td>Telematic data</td>
<td></td>
<td>12%</td>
<td>14%</td>
</tr>
<tr>
<td>Sensor data</td>
<td>2%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Video data (e.g. digital video)</td>
<td>3%</td>
<td>9%</td>
<td></td>
</tr>
</tbody>
</table>
Few insurers have invested in the specialized technical infrastructure for Big Data, but significant numbers are planning to.

<table>
<thead>
<tr>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appliances</td>
<td></td>
</tr>
<tr>
<td>Hardware devices designed and optimized for acquiring, organizing, and storing unstructured data</td>
<td>IBM Netezza</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Oracle’s Big Data Appliance</td>
<td></td>
</tr>
<tr>
<td>Databases/file systems</td>
<td></td>
</tr>
<tr>
<td>Storage and processing software that are optimized for processing large amounts of unstructured data</td>
<td>Hadoop</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>NoSQL</td>
<td></td>
</tr>
<tr>
<td>Analysis and parsing tools</td>
<td></td>
</tr>
<tr>
<td>Software designed to decipher and extract meaning from data in any encoding and format, then process it to look for analytic patterns</td>
<td>HParser</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Quality Manager Trillium</td>
<td></td>
</tr>
</tbody>
</table>
Big Data Use Cases
Reinvent Customer Relationships

**Customer Outcome Framework**

### Big Data / Analytics Focus Areas:
- Reputation Management
- New Product Innovation
- Sales and Marketing effectiveness
- Customer Retention
- Customer Acquisition
- Customer Service

### Outcomes
- Optimized call centers
- Improved customer satisfaction
- Retained customers
- Acquired customers
- Increased share of wallet
- Risk Reduction
- Cost reduction
- Increased revenue
- Increased profits

### Business Metrics
- Risk Exposure Index
- Customer satisfaction score
- Customer retention percentage
- New Product/service in market
- Modified product/services
- Customer acquisition percentage
- Promotion campaign ROI
- Marketing spend
- New Revenue percentage
- Revenue growth percentage
- Expense ratio
- Combined ratio
- Operating ratio

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Fraud Mitigation

- Fraud across all lines of business is on the rise - making fraud mitigation a growing priority
- Reducing loss and expense - while accelerating claim settlement times - are key objectives
- Increasing the efficiency of Adjuster and SIU resources drives further expense reduction

Outcome Framework

Big Data / Analytics Focus Areas:
- Fraud Mitigation
- Catastrophe modeling

Outcomes
- Loss reduction
- Expense reduction
- Accelerated claim settlement times
- Improved efficiencies

Business Metrics
- Loss Ratio
- Expense Ratio
- Combined Ratio
- Claims Pending
Scenario: Fraud in Retail Stores - Slip, Trip and Fall

- Claims Database
- Text Sources
- Internet Content
- Imaged Content
- email

Domain Specifics

Concept: soft tissue injury
stress, strain, sprain, swelling, soft, tissue, injury, contusion, bruise, etc

Indicator: combines concepts
- Un-witnessed soft tissue injury
- Claimant had no health insurance
- Claimant is unemployed
- Claimant has a prior injury or medical history

Actionable Claims
A New Approach to Fraud and Subrogation

Scoring Models and Dictionaries

- Fraud
- Subrogation

- Workers Comp
- General Liability
- Auto
- Property

All claim data is fused together

All claims are analyzed and scored

Scored claims are assigned to 1 of 4 tiers

Claims Administration
Straight through processing

Intelligent Workflow

Appropriate Claim Examiner

Subrogation Unit

SIU

Supervisor

Other

- Claims Database
- Text Sources
- Internet Content
- Imaged Content
- Email
- Social Media
- 3rd Party Data

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Benefits

Fraud Detection
- Identify and categorize suspicious claims more accurately and earlier in the claim lifecycle
- 3X – 5X accuracy improvement in SIU referrals

Subrogation
- Identify subrogation opportunities more accurately and earlier in the claim lifecycle
- Score and categorize opportunities based on amount, likelihood of success and projected effort
- Increase identification rate by 2X – 3X and average opportunity value by 10 – 30%

Straight Through Processing (STP)
- Quickly route claims without suspicion and subrogation opportunities to expedite processing
- Reduce claim handling costs by 5 – 25%
- Improve customer satisfaction

Claim Frequency and Severity
- Reduce claim frequency and severity by analyzing unstructured claim data
- Improve loss ratio and reserve accuracy
Cash Flow initiatives

- Managing cash balances and reserves is mission critical
- Investment strategies are dependent upon a real-time visibility to cash position
- Improved cash flow provides more opportunity for investment managers

Outcome Framework

Big Data / Analytics Focus Areas:
- Identify Re-Insurance Recoverable Opportunities
- Identify Subrogation Opportunities
- Recover Third Party Deductibles

Outcomes
- Optimized investment management
- Improved cash flow

Business Metrics
- Liquidity Ratio
- Operating Cash Flow
- Net Cash Flow Percentage
- Working Capital Ratio
Focus on Claim Analytics enables several business outcomes and shines a light on:

- Claim frequency, severity, and duration
- Reserve accuracy
- Risk/price relationship
- Other

Outcome Framework

**Big Data / Analytics Focus Areas:**

- Optimal assignment of claims
- High-severity claims flagged and routed to specific SIU resources for proper handling
- Facilitate better estimates of the ultimate value of a claim
- Identify the claims with the highest propensity for litigation

**Outcomes**

- Improved risk/price relationship
- Improved decision quality
- Risk reduction
- Optimized loss reserves
- Increased profits

**Business Metrics**

- Combined ratio
- Operating ratio
- Loss ratio
- Risk exposure index
- Loss reserve surplus
- Capital adequacy ratios

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Underwriting is a critical area of differentiation

- Long underwriting cycle times translate to lost revenue
- Improvements in underwriting process have significant bottom line impact
- Improved expense and loss ratios enable pricing flexibility and customer acquisition

Outcome Framework

**Big Data / Analytics Focus Areas:**
- Rate making and price optimization
- Broaden the base of data to improve analytic precision
- Analyze Telematics data
- Real-time analysis

**Outcomes**
- Improves service levels
- Improved customer satisfaction
- Retained customers
- Improved decision quality
- Cost reduction
- Increased profits

**Business Metrics**
- Customer retention percentage
- Average speed of underwriting
- Customer satisfaction score
- Service support score
- Underwriting ratio
- Expense ratio
- Loss ratio
Leverage Big Data to uncover the insight contained in a broader universe of data

Use an outcome-based framework that ensures linkage to enabled actions, actionable insight and data

Use a portfolio approach to optimize the types and mix of analytic applications that deliver actionable insight
Considerations For The Future
Insurers formulating their plans to leverage Big Data and Analytics should follow the business need. Insights without action create no value.

- While technologists and data specialists can get excited about the potential value of integrating new data sources and analytics capabilities, analytics initiatives that are not requested by the business will fail because business will not take advantage of them.

- This was the ignominious end of many data warehousing projects in the late 90’s and early 2000’s, and the scars are still fresh for many companies.

- The first step for insurance data and analytics specialists (beyond R&D initiatives like pilot programs or proof of concept experiments) must be to encourage business executives to think about the potential value of the outcome, and gauge the willingness of senior leaders to drive change.
Questions