GIRO conference and exhibition 2010
Catherine BARTON, Partner – Ernst & Young Actuarial Services
Nicolas MALLISON, Director – Ernst & Young Fraud Investigations & Disputes

Proactive Data Driven Counter Fraud
Mining for digital gold

12-15 October 2010
"The Governor of the Bank of France, Christian Noyer, said SocGen was not guilty of wrongdoing and that M. Kerviel's ability as a "computer genius" had allowed him to escape the bank's internal controls."

The Independent, Sean Farrell, Financial Editor
Introducing Proactive Data Driven Counter Fraud

Manage fraud risks proactively

Quickly and cost effectively identify the most relevant information by leveraging the knowledge inside large scale datasets
The Fraud Triangle

**RATIONALISATION**
- I don’t get paid enough
- The company owes me anyway
- Nobody is getting hurt
- Everyone else is doing it
- Nobody will find out
- Financial gain: large or small
- Reputational gain
- Reduce pressure to perform
- Reduce job stress
- Malignant narcissism: Psychological gratification
- I will just do this once
- I need to recoup some of the premium I paid
- It is less than 1p on every policy
- The company can afford it

**PRESSURE/INCENTIVE**
- Skills to execute the fraud
- Weaknesses to exploit
- Controls that can be overridden
- Partners in crime to help out
- Access to confidential business information

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# Fraud Triangle in Insurance

<table>
<thead>
<tr>
<th>Source</th>
<th>Rationalisation</th>
<th>Pressure/Incentive</th>
<th>Opportunity</th>
<th>Example Fraud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee / Internal – Theft from company</td>
<td>“The company owes me a raise”</td>
<td>Large debts</td>
<td>Working in claims department</td>
<td>Pays false claims in collusion with accomplice; steals mass data</td>
</tr>
<tr>
<td>Soft – Opportunistic low level crimes</td>
<td>“It’s a large company – it’s not like we’re robbing anyone”</td>
<td>Bit of easy extra cash</td>
<td>Belief genuine claims element can’t be distinguished from fake</td>
<td>Camera stolen and additionally decides to add on ipod as want to get new model</td>
</tr>
<tr>
<td>Hard – Organised crime</td>
<td>“Their claims handling is weak – they will never find us out”</td>
<td>Large financial gains</td>
<td>Willing partners in crime with skills to carry out scheme</td>
<td>“Crash for cash” schemes.</td>
</tr>
</tbody>
</table>
### The 2 key stages of fighting insurance fraud

**Detection versus Investigation / Review**

<table>
<thead>
<tr>
<th>DETECTION</th>
<th>REVIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>- “Needles in the big haystack” perspective: Detection is an analytical statistical game with goal improving the odds of finding the fraud (“needles”) and focus / prioritise further investigation efforts</td>
<td>- Process of manually reviewing referred potential fraud cases with the aim to prove or disprove fraud</td>
</tr>
<tr>
<td>- The end game is isolating small “needle rich” pool of hay rather than seeking to pick out individual “needles” (hard). It is not about finding the “needles”, it is about removing the hay</td>
<td>- Use of technology tool (data visualisation / link analysis, database lookup) to help a robust and cost effective identification and collation of evidence amongst databases and electronic documents</td>
</tr>
<tr>
<td>- Effectiveness of Detection can be measure with 2 metrics:</td>
<td>- Understanding of modus operandi of confirmed fraud cases can be fed back in data acquisition/preparation and business understanding</td>
</tr>
<tr>
<td></td>
<td>- Investigation outcomes can be used to train machine learning predictive technology that can continuously improve the logic and performance of detection</td>
</tr>
</tbody>
</table>

- detection rate: % of confirmed fraud case in identified potential fraud pool
- False positive rate: % of non fraud case in identified potential fraud pool

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The 2 key stages of fighting insurance fraud

Detection
The 2 key stages of fighting insurance fraud

Investigation / Review
Where Proactive Data Driven Counter Fraud technology can help?

**Determine the right claims to focus on**
- Identify and prioritise the most suspect cases at the earliest possible opportunity based on consistent non judgemental data driven inspection of all claims

**Decide what is the most appropriate action**
- Integrate in the claim handling workflow risk based decisions points based on claim fraud propensity and differentiate actions based on suspicion level and mitigation potential
- Utilise insight into the key dimensions driving each type of fraud detected in order to “fraud proof” existing processes and systems

**Data driven investigation case management**
- Presentation of referral cases to fraud investigators in a user friendly web case management interface giving them interactive access to all the underlying data for link analysis and investigative search purposes

**Measure and manage results**
- Analysis of trends in fraud detection and mitigation performance through interactive web based management dashboard
What can Proactive Data Driven Counter Fraud achieve?

**Significantly increase the detection rate and decrease the false positive rate of currently detected types of fraud**

- This means the return on fraud investigation/review spend can be optimised as special investigation units, loss adjusters and claims handlers can prioritise their efforts according to the fraud propensity of each claim

**Detection of a new unknown and emerging type of fraudulent claims through proactive identification of unusual activity and anomalous patterns**

- This enable a much earlier identification of new and emerging type of fraud enabling over time the saving of a large quantity of payments that would have occurred until the new type of fraud is detected either by chance or because the repetition patterns in data become obvious
Proactive Data Driven Counter Fraud

Data Driven Fraud Detection & Intelligence Framework

Acquire Data

Transform Data

Analyse Data

Access Data

Decide

INTERNAL
- Claims history
- Policy history
- Investigation outcomes
- Watch lists
- Access Control

EXTERNAL
- 3rd party
- Fraud data
- Cross industry data sharing

INVESTIGATIVE DATA LINKING

RED FLAGS RULES

SEARCH, EDIT & VISUALISE

UNUSUAL PATTERNS

SOCIAL NETWORKS

PREDICTIVE MODELS

“IT IS NOT ABOUT FINDING THE NEEDLE, IT IS ABOUT REMOVING THE HAY”

OUTCOMES CAPTURE

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Approaches to Fraud Detection

Whistle blowers

Investigative Data Linking / Multi-level Association

• Advanced data matching techniques and algorithms that seek to automate on large data sets the thought process of a human investigator

• Analysis of link patterns between policies, claims and entities in the resulting event networks

Text mining

• Automatically extract information from free text notes, maps to concepts / entities and taxonomies to facilitate further down searches for unusual and predictive patterns in data across vast amount of records and variables
Investigative Data Linking / Multi-level Association

**Illustrative example**

<table>
<thead>
<tr>
<th>Rec ID</th>
<th>Document Type</th>
<th>Name</th>
<th>DOB</th>
<th>Debit card</th>
<th>Phone</th>
<th>Address</th>
<th>Car</th>
</tr>
</thead>
<tbody>
<tr>
<td>P12568</td>
<td>Policy holder</td>
<td>SAEEED KAMRAN</td>
<td>01/01/1974</td>
<td>661230</td>
<td>012036154993</td>
<td>07920 623 560</td>
<td>Flat 2, 20 Tregunter Rd, SW10 9LH London</td>
</tr>
<tr>
<td>C56987-C</td>
<td>Claim claimant</td>
<td>KHAMRAN SAID</td>
<td>16/01/1974</td>
<td>07919 446 502</td>
<td></td>
<td>2A / 20 ter Tregunter road, Chelsea SW109LH</td>
<td>MERCEDES CE 320 245I</td>
</tr>
<tr>
<td>C58742-C</td>
<td>Claim injured</td>
<td>SAYED K</td>
<td>16/01/1974</td>
<td>07919 446 502</td>
<td></td>
<td>175 Bis Westbourne Grove</td>
<td>Noting Hill W11 2SB</td>
</tr>
<tr>
<td>P12458</td>
<td>policy holder</td>
<td>SAYED K</td>
<td>661230</td>
<td>012036154993</td>
<td>0207 370 6496</td>
<td>175 Westbourne Road W11 2BS London</td>
<td>MERCEDES S 500</td>
</tr>
</tbody>
</table>

**Insurer Data Universe**

- Claims
- Access Ctrl
- Policy
- 3rd Party
- FIU
- Watch lists

**UNUSUAL HIGH FRAUD PROBABILITY**

**Rules and models to identify suspects**

- Links with previous suspected fraud activity
- Unusual “ring” – circular link patterns
- Unusual combination of red flags such as:
  - Indirect links between claimants and 3rd parties
  - Unusual pattern of information access
  - Evidence of potential data obfuscation
  - Hit on fraud hot list / third party risk indicator

**EXAMPLE ONLY USING ALTERED DATA**

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Text Mining for fraud detection

- Intelligent spell checking
- Dictionaries, External or user-built thesauri
- Categorization
- Clustering
- Entity extraction
- Natural language search
- Interactive multi-dimensional analysis
- Visual link analysis

- Pattern definition language:
  - Proximity (N terms, sentences, paragraphs)
  - Sequence
  - Negations
  - Sentiment
  - Synonyms
  - Hierarchical thesaurus relations
  - Phonetics
  - Regular expressions
  - Morphology
Technology Demonstration
Text Mining on claims notes data
with Megaputer’s PolyAnalyst
Approaches to Fraud Detection

**Rule-based approach**

- look for matches with known fraud schemes – low hanging fruit
- Relatively rigid, slowly or non adaptative and easy to circumvent

**Model-based / Forensic Data Mining approach**

- Look for specific patterns in data across vast amount of records and variables
- Unusual patterns may point towards new type of emerging fraud
- Automatically infer from data patterns closely resembling previous case of fraud without having to specify a rule (predictive fraud propensity model).

**Interactive aggregation, visualization and reporting**
The difficulty of fabricating data

Unusual Patterns

Which one of the 2 sequences of numbers below is NOT a random string of 0/1 with ½ probability?

| 010001110011011 | 010110101100110 |
| 01111010101100110 | 110101010011011 |
| 000011011100111 | 010101001011001 |
| 010000001011000 | 011010110010101 |
| 010100001101010 | 010101101101010 |
| 101010101111101 | 101010010011001 |
Sometimes less is more

**Rules-based with model-based aggregation**

| Supplier Name | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | AA | AB | AC | AD | AE | AF | AG | AH | AI | AJ | AK |
| Supplier No. 7 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 2 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 3 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 5 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 6 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 31 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 7 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 4 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 6 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 8 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 9 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 26 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 32 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 33 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 34 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 44 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 45 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 25 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 21 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 10 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 9 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| Supplier No. 20 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |

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Technology Demonstration

Healthcare Behavioural Deviation Fraud Detection Solution

- Determine the “norm” for different situations and identify deviations from the norm
- Identify anomalous providers and their profiles
- Combine obtained results with relevant business considerations

Raw data
(CMS-15000, UB-92, etc.)

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YOUR CHOICE...

REACTIVE

PROACTIVE

"IT IS BETTER TO DRAIN THE SWAMPS THAN TO FIGHT THE ALLIGATORS"

PROF IRVIN WALLER, DIRECTOR GENERAL, INTERNATIONAL CENTRE FOR THE PREVENTION OF CRIME - 8 MARCH 1996
Contact details

Catherine Barton
Partner
European Actuarial Services

Direct: +44 207 951 5503
Mobile: +44 771 104 8102
cbarton@uk.ey.com

Nicolas Mallison
Director – Fraud Data Analytics
Fraud Investigations & Disputes

Direct: +44 207 951 2750
Mobile: +44 792 082 3560
nmallison@uk.ey.com