



Predictive Analytics: Delivering on the Promise of Big Data

CASACT Ratemaking &
Product Management
Seminar
March 2014

Eric Siegel, Ph.D.
Founder, Predictive Analytics World
Author, *Predictive Analytics*

Eric Siegel, Ph.D.



PREDICTIVE ANALYTICS Times

The predictive analytics professionals' premier resource



BOOK:

Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die
www.thepredictionbook.com

CONFERENCE:

Predictive Analytics World
San Francisco, Chicago, Boston, Washington DC, Toronto, Berlin, and London
www.predictiveanalyticsworld.com

ONLINE PORTAL AND NEWS SITE:

Predictive Analytics Times
www.predictiveanalyticstimes.com

CONFERENCE:

Text Analytics World
San Francisco and Boston
www.textanalyticsworld.com

Online training:

"Predictive Analytics Applied" - *View it on-demand*
www.businessprediction.com



CHICAGO
June 17-18, 2014



BOSTON
October 6-7, 2014

PREDICTIVE ANALYTICS Times

The predictive analytics professionals' premier resource

BREAKING NEWS resotation of Predictive... Wise Practitioner- Predictive Analytics Interview Series: Vikash Singh In anticipation of his upcoming conf



Welcome to the Predictive Analytics Times

We're proud to present the most innovative of the Predictive Analytics Times. It provides more of what you love - Industry insight, news and information. We'll continue to send monthly emails highlighting the newest content, but our new industry portal is so much more! Sign up today to take advantage of all things Predictive. For feedback, thoughts or ideas, don't hesitate to contact us.



By: Dr. John Elder, CEO and Founder, Elder Research, Inc.
(Part 2 of 11 of the Top 10 Data Mining Mistakes, drawn largely from Chapter 20 of the Handbook of Statistical Analysis and

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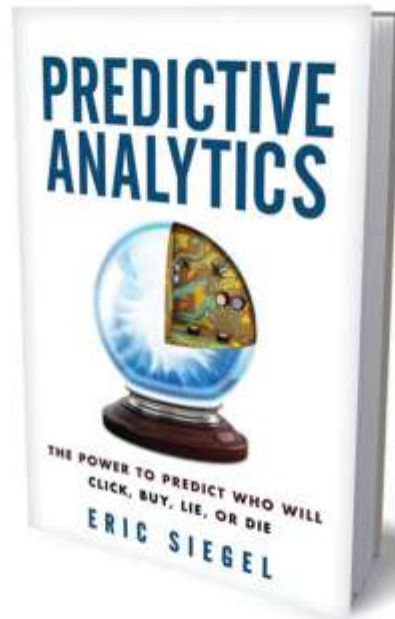
ADVERTISEMENTS



predict risk

(almost two decades ago) used neural |

Overcoming Big Data Challenges:
How to Generate Deep Insights



www.ThePredictionBook.com

Predictive Analytics for Insurance

- 1) Pricing
- 2) Selection
- 3) Marketing
- 4) Fraud detection
- 5) Fast-tracking claims

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Marketing (along with credit risk) is the foundational business application of predictive analytics.

Agenda

- 1) Risk
- 2) Intro to PA – *The Prediction Effect*
- 3) How it works – *The Data Effect*
- 4) How it bolsters insurance
- 5) Insurance case studies







The concept of risk applies in:

- insurance
- financial credit
- health
- and even marketing



I am an individual patient, and an individual insurance policyholder. Risk effects all parties involved.



Insured “office workers”

“*Insurance is nothing but management of information. It is pooling of risk, and whoever can manipulate information the best has a significant competitive advantage.*”

Eric Webster
VP Marketing, State Farm

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"Discussion with State Farm's Eric Webster: Insurance and Data Mining,"
Gregory Piatetsky, Ph.D., KDNuggets.
<http://www.kdnuggets.com/news/2009/n08/3i.html>

Risk an individual may:

- **Become a loss**
- **Become ill**
- **Not respond**
- **Commit fraud**

A large, dense crowd of people is shown on the right side of the slide. Four black lines with circular endpoints point from the crowd to the four list items on the left. The crowd is composed of many individuals, mostly men, wearing various colored shirts, creating a mosaic of colors.

“

No certified, regulated profession like the actuarial practice exists outside of what is strictly considered insurance.”

Douglas Hubbard

The Failure of Risk Management

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Also: <http://www.prnewswire.com/news-releases/deloitte-poll-37-percent-of-companies-report-having-no-consistent-risk-data-mining-reporting-and-analysis-116644679.html>



What is predictive analytics?

How does it address micro-risk?

Agenda

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- 2) **Intro to PA – *The Prediction Effect***
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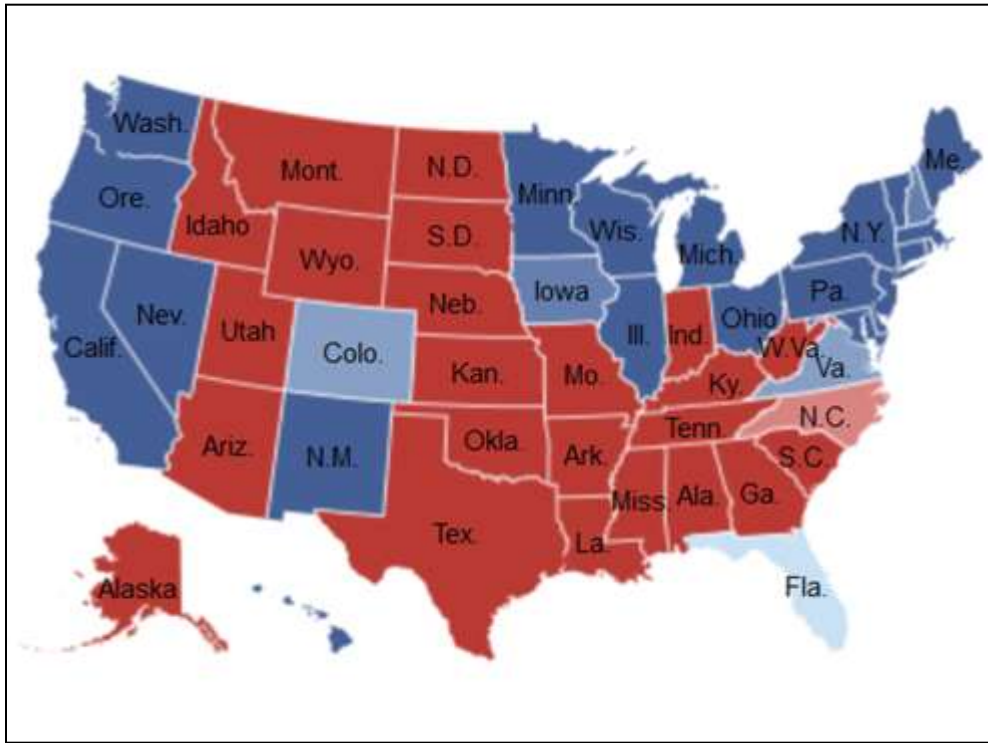




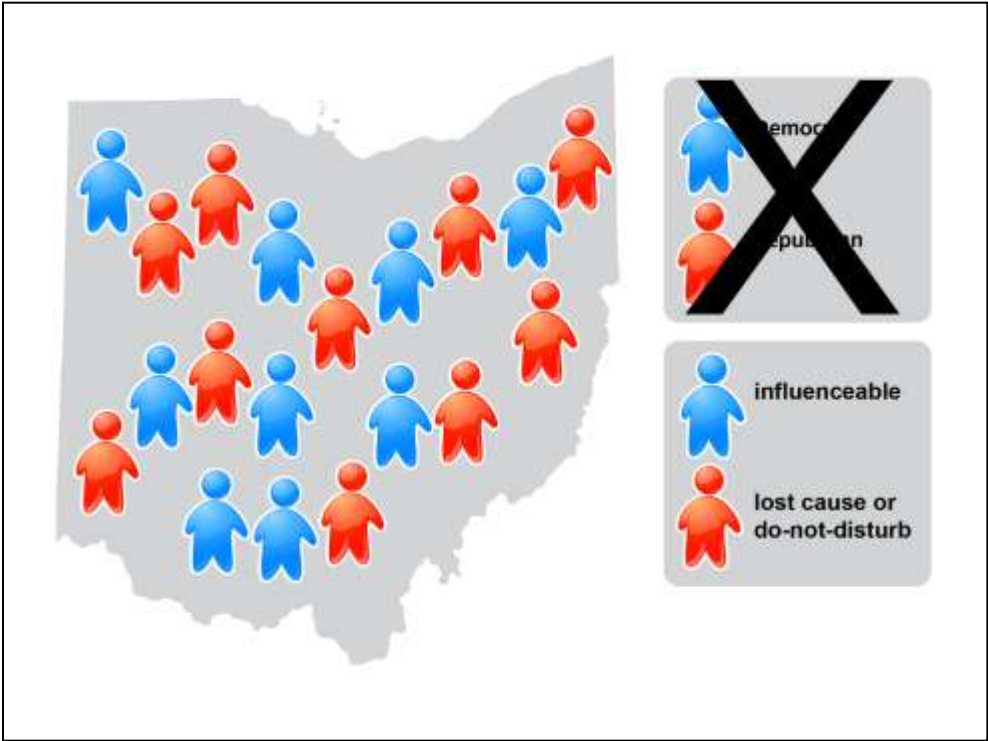
For the story on exactly how Obama's campaign used predictive analytics in 2012:

<http://bigthink.com/experts-corner/team-obama-mastered-the-science-of-mass-persuasion-and-won>

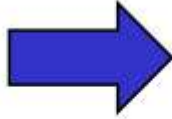
<http://www.predictiveanalyticsworld.com/patimes/obama/>







Treatments







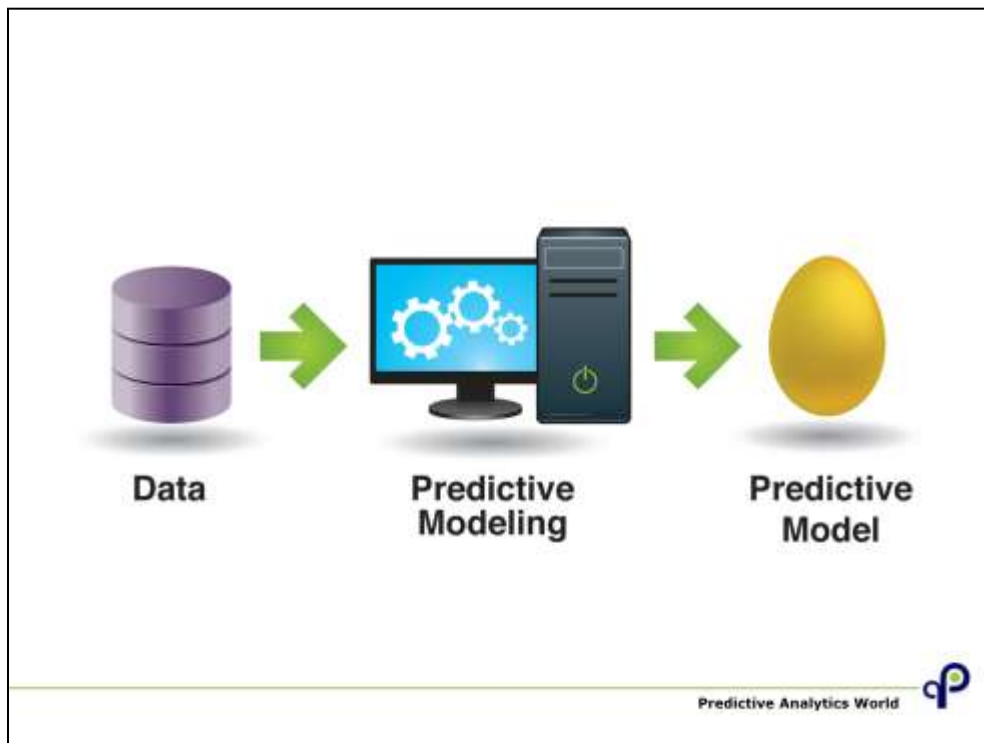
Predictive Analytics:



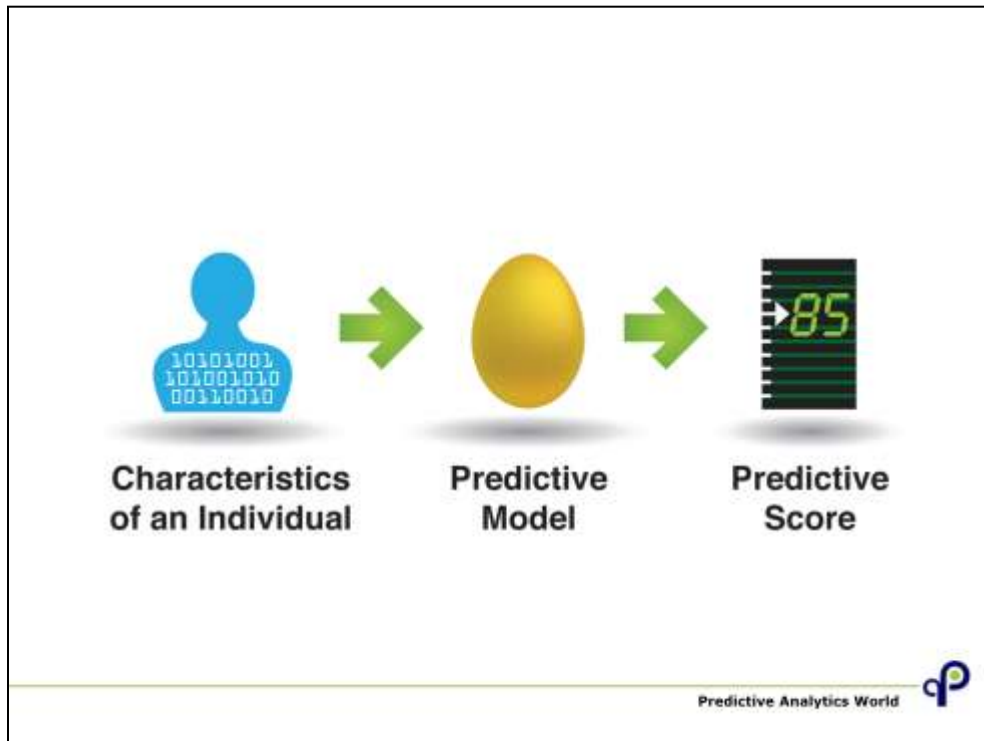
(data)

*Technology that learns from **experience** to predict the outcome/behavior of individuals ... in order to drive better decisions.*

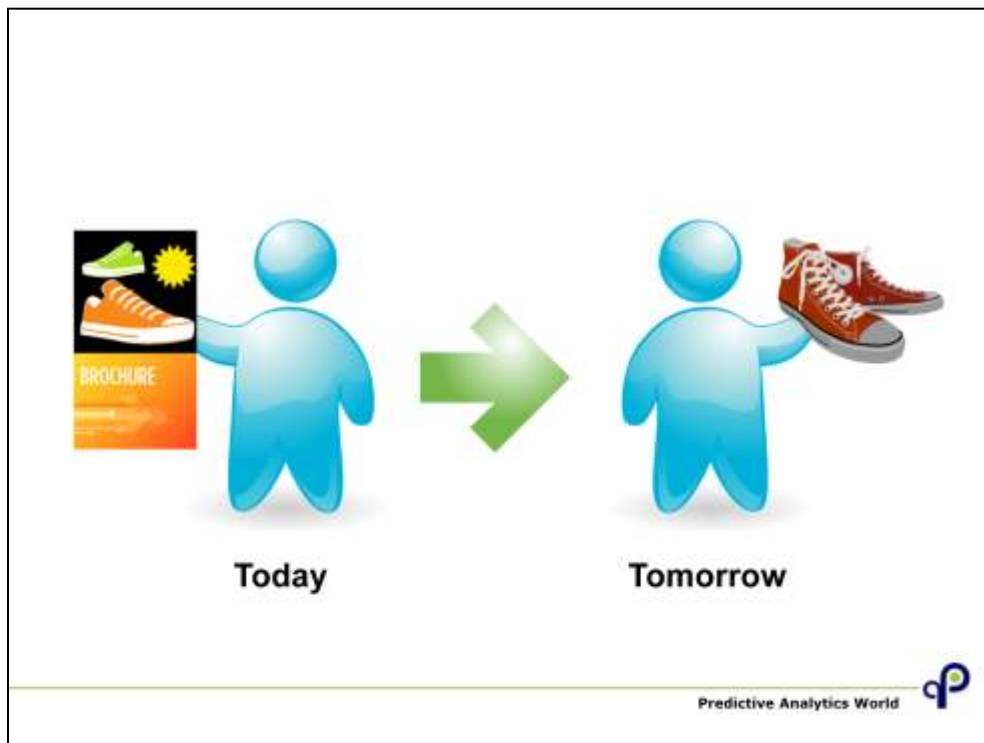




Predictive modeling learns from data in order to generate a predictive model. For details on how this work see Chapter 4 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (<http://www.thepredictionbook.com>).



A predictive model generates a predictive score for an individual. For details on how this work see Chapters 1 and 4 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (<http://www.thepredictionbook.com>).

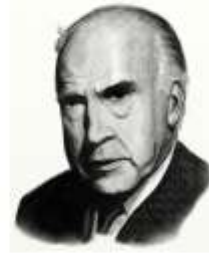


Marketing targets an individual predicted as likely to buy. For details on how this work see the Introduction and Chapter 1 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (<http://www.thepredictionbook.com>).

Prediction

Prediction is very difficult, especially if it's about the future.

- Niels Bohr



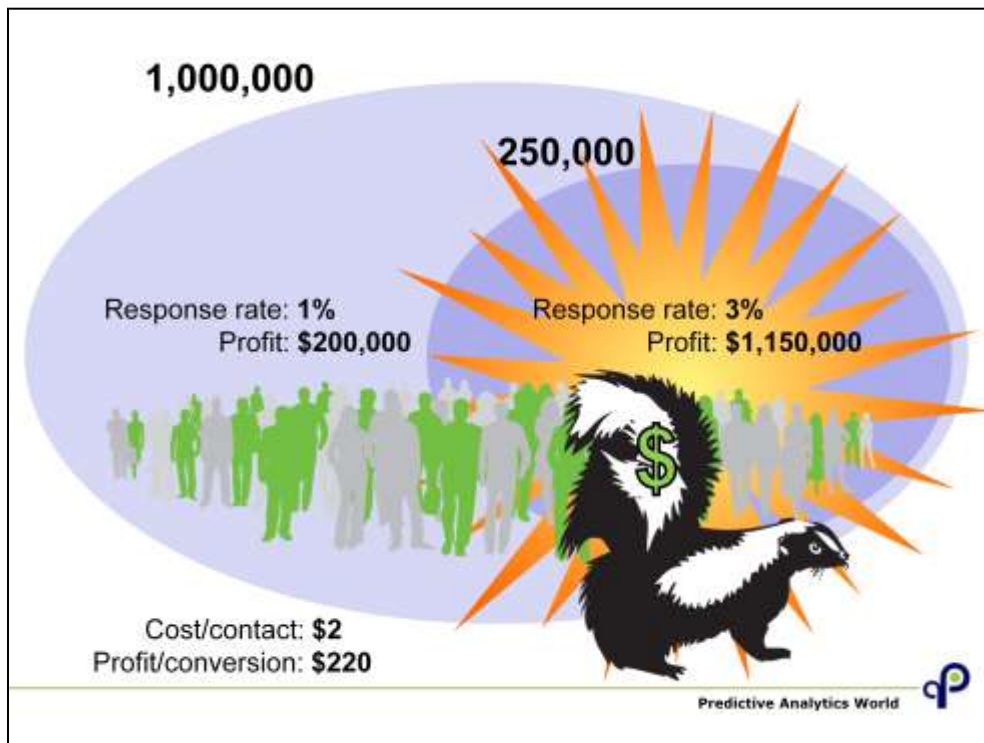
How come you never see a headline like "Psychic Wins Lottery"?

- Jay Leno

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Is prediction an audacious goal? Isn't prediction impossible? For details on how why predictive analytics predicts well enough, see the Introduction and Chapter 1 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (<http://www.thepredictionbook.com>).



A crummy predictive model delivers big value. It's like a skunk with bling.

Simple arithmetic shows the bottom line profit of direct mail, both in general and then improved by predictively targeting (and only contacting 25% of the list). The less simple part is how the predictive scores are generated for each individual in order to determine exactly who belongs in that 25%. For details on how this work see Chapter 1 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (<http://www.thepredictionbook.com>).

The Prediction Effect:

A little prediction goes a long way.

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Put another way, predicting better than guessing is often sufficient to generate great value by rendering operations more efficient and effective. For details on how this works, see the Introduction and Chapter 1 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (<http://www.thepredictionbook.com>).

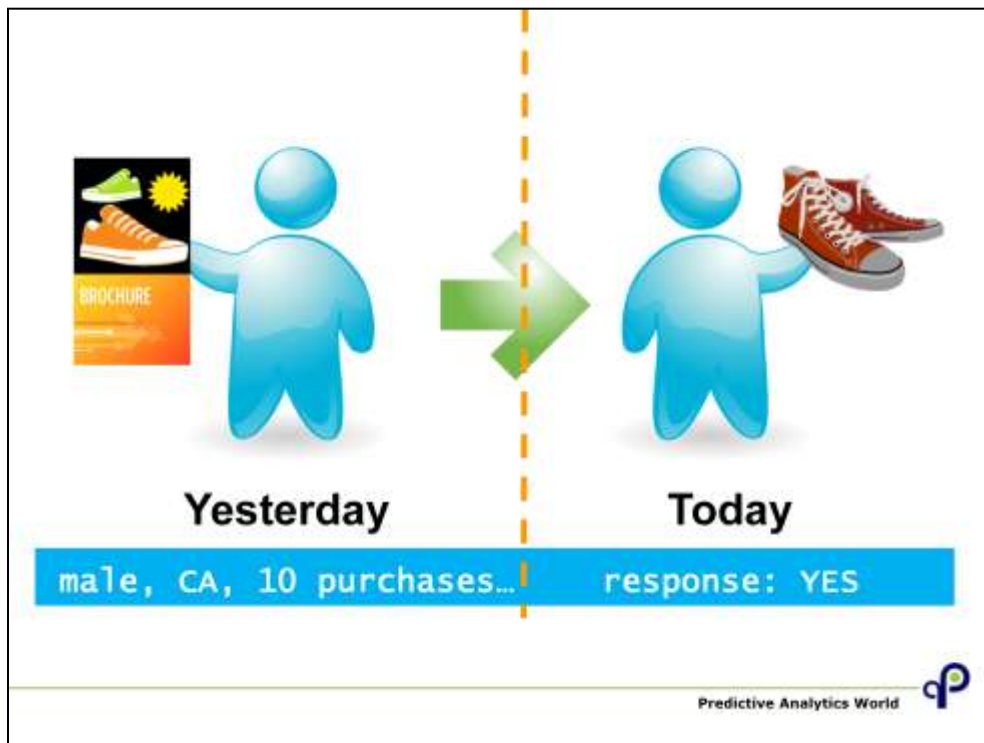
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- 3) **How it works – *The Data Effect***
- 4) How it bolsters insurance
- 5) Insurance case studies



Yesterday is history, tomorrow is a mystery, but today is a gift. That is why it is called the "present."





Each row of *training data* corresponds to one individual – first the individual’s facts and figures are listed (predictor variables, aka independent variables), and then the target variable (aka dependent variable) – ie, the thing you’re trying to predict – is listed.

A table of such rows composes the training data, on which predictive modeling operates.

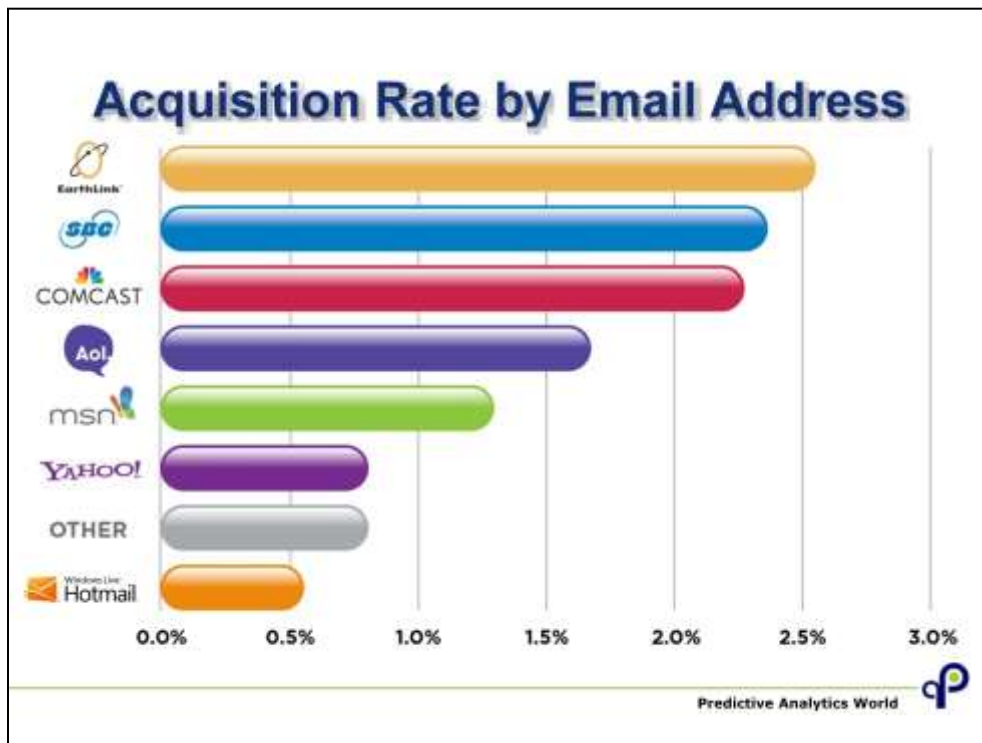
Diapers → Beer



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Urban myth to some, but based on reported results:
<http://www.dssresources.com/newsletters/66.php>



Online conversion to paying membership, by email domain. Customers who sign up with "Hotmail" and "Yahoo" email accounts are far less likely (20 - 25% as likely) to convert to a paid subscription than users with email addresses that may be more "permanent," such as ".net" or "EarthLink" email addresses. This insight speaks directly to business strategy, such as employing incentives for customers to provide permanent email addresses, or partnering with certain email service providers.



Credit card used at the dentist

→ **Less likely to miss payments repeatedly**

Canadian Tire example, from "What Does Your Credit-Card Company Know About You?" New York Times, May 12, 2009.

<http://www.nytimes.com/2009/05/17/magazine/17credit-t.html>



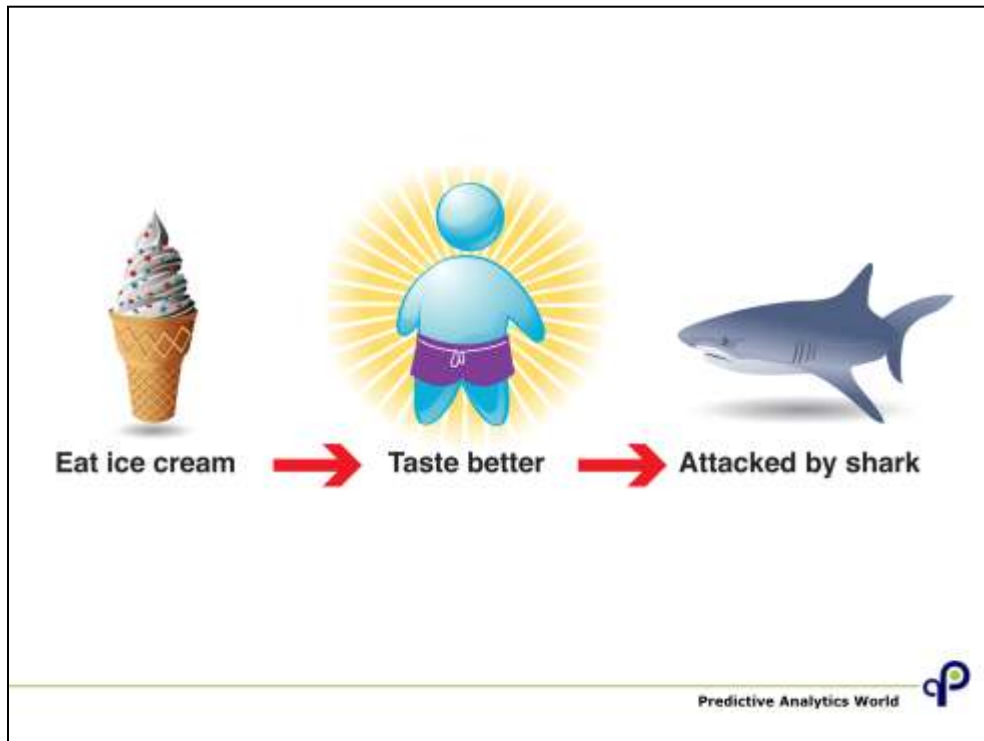
Dental patients miss fewer payments.

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The Data Effect:

Data is always predictive.



Correlation does not entail causation. For more information, see Chapter 3 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (<http://www.thepredictionbook.com>).



Mysterious chemical in your bloodstream → **More prone to cigarette addiction**
→ **Less prone to carpal tunnel**



Smoke



Take more breaks



Less carpal tunnel

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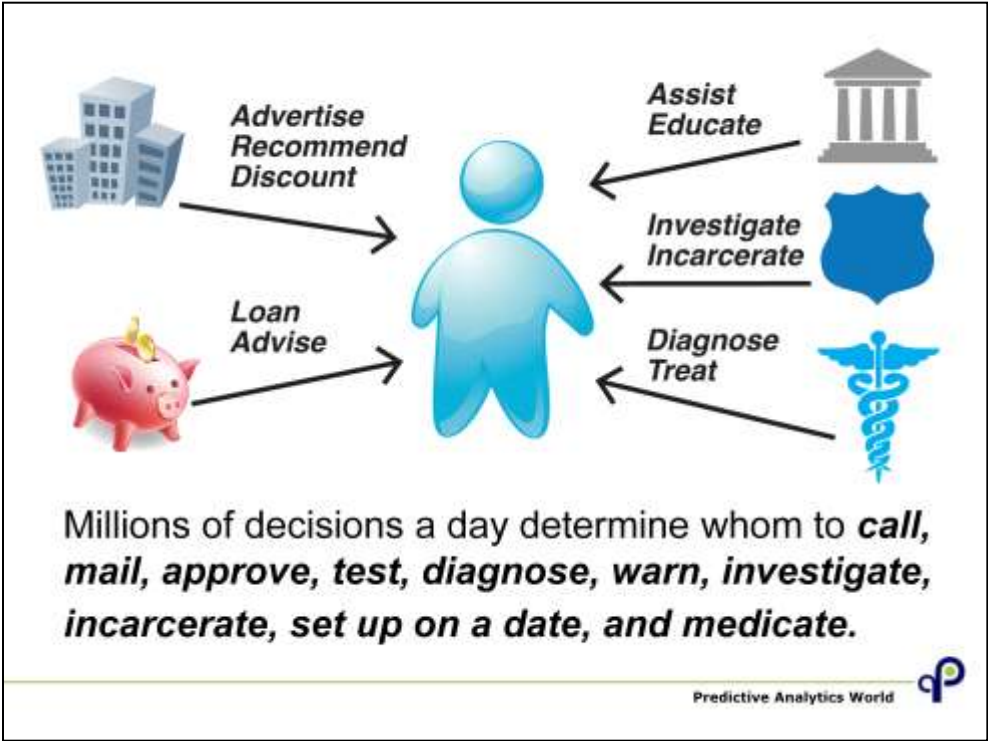
	FINANCIAL SERVICES
	<i>Lowered direct mail costs 20% Increased response rate 3.1% 600% ROI</i>
	RETAIL
	<i>Improved direct mail targeting by 15-20%</i>
	FINANCIAL SERVICES
	<i>Reduced mailing costs by \$12 million</i>

...and many more, such as Cox Communications, FedEx, Sprint, etc. - see the book "Predictive Analytics" (www.thepredictionbook) for many case studies, including a central compendium of 147 mini-case studies, of which 37 are examples in marketing applications of predictive analytics.

PREMIER Bankcard also lowered delinquency to increase net by over \$10 million

More information about First Tennessee Bank and other case studies are available at <http://tinyurl.com/PAExamples>

Dan Marks, First Tennessee Bank, "First Tennessee Bank: Analytics Drives Higher ROI from Marketing Programs," IBM.com, March 9, 2011.
www.ibm.com/smarterplanet/us/en/leadership/firstttenbank/assets/pdf/IBM-firstTennBank.pdf





like, love, procreate



buy, cancel, click



*default on payment,
crash your car*



quit job

*vote, qualify for
benefits, drop out*



*commit crime, fraud,
murder*



get sick, die



think, lie



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- 1) Risk
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- 3) How it works – *The Data Effect*
- 4) **How it bolsters insurance**
- 5) Insurance case studies



“*Insurance has always been about predictive analytics. What are actuarial tables, loss history analysis, and pricing/risk algorithms if not “predictive”?*”

Seth Earley
Earley & Associates

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http://uk.smartgridupdate.com/fc_fcbl1z/lz.aspx?p1=056892S4006&CC=&p=1&cID=0&cValue=1

Insurance → PA

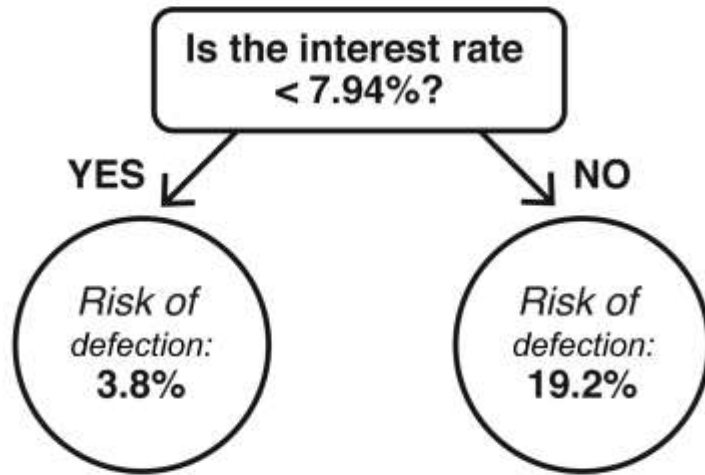
PA → Insurance ?

As Janet Jackson asked, "What have you done for me lately?"

Advantages of Predictive Analytics

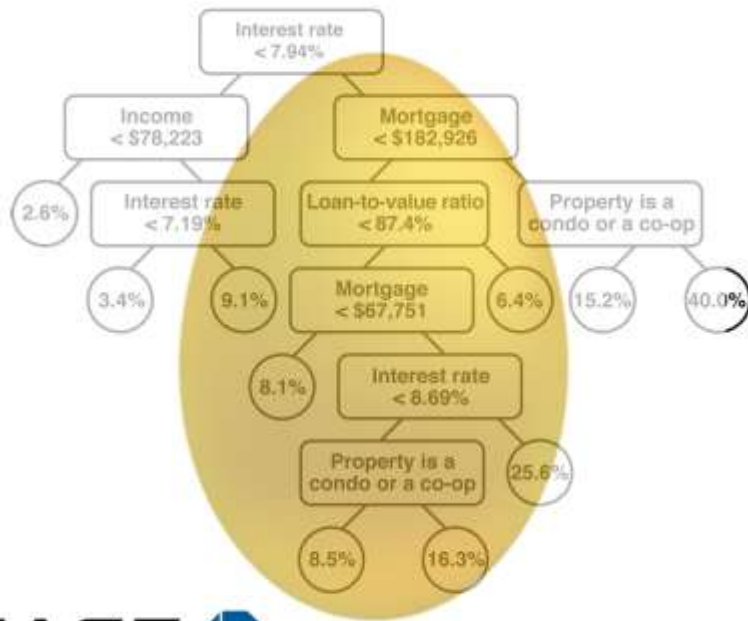
1. Data elements
2. Mathematical models


Customer Attrition: Mortgages



CHASE 

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IF:

the mortgage is greater than or equal to \$67,751 and less than \$182,926

AND:

the interest rate is greater than or equal to 8.69 percent

AND:

the loan-to-value ratio is less than 87.4 percent

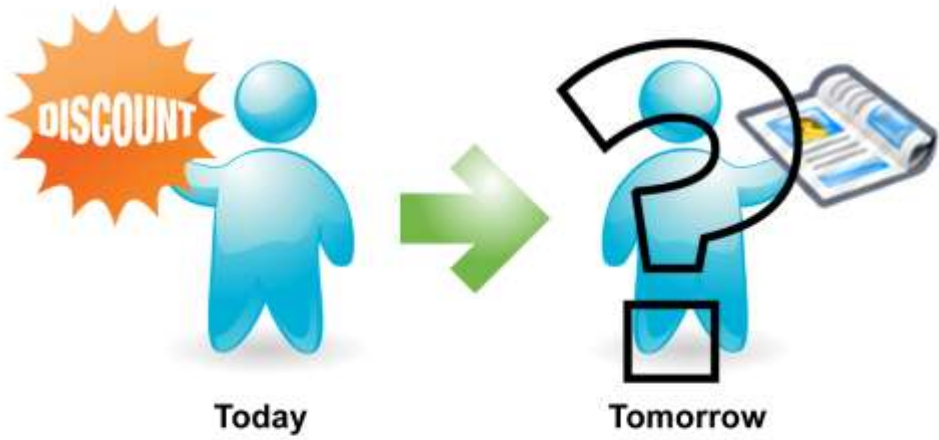
THEN:

the probability of prepayment is 25.6 percent.

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Much higher than the overall average of 9.4% prepayment rate.



**RENEW YOUR
CELL PHONE
CONTRACT...**



**AND
GET A FREE
PHONE!**





Agenda

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Predictive Analytics' Improvement:

A leading international commercial lines insurance provider



Predictive models decreased the loss ratio by a half point, contributing to savings of almost \$50 million.

With predictive modeling, tripled the accuracy of predicting bodily injury liability - worth an estimated \$40 million annually.



Ascertain secondary medical conditions from workers' compensation claim notes; predictive of high-cost injuries.

Plus life insurance companies – see the notes section below

Leading international commercial lines insurance provider: This was from a case study at a conference presentation; however, the insurance company later rescinded authorization to be named in connection with this example. Here is a reference on the general principle that predictive modeling improves upon standard actuarial methods: Guillaume Briere-Giroux, FSA, MAAA, CFA, "Predictive Modeling Applied to Variable Annuity Lapse Rates," Predictive Modeling for Variable Annuities. www.claudepenland.com/2011/02/12/predictivemodeling-applied-to-variable-annuity-lapse-rates/.

Allstate: With a predictive modeling competition in 2012, tripled the accuracy of predicting bodily injury liability based solely on the characteristics of the insured vehicle. This could be worth an estimated \$40 million annually to the company -- Kaggle, Allstate, "Predicting Liability for Injury from Car Accidents," Competition, April 13, 2012. www.kaggle.com/host/casestudies/allstate. Here is how the \$40 million estimate is derived. Allstate's 2010 annual report puts bodily injury claims at roughly \$1.6 billion. Industry insiders suggest 20 percent of bodily injury claims actuarially relate to vehicle. If we assume that a 1 percent improvement in error rate impacts claims costs by 0.25 percent, even just doubling the accuracy comes to a \$40 million savings. See also www.iihs.org/research/hldi/fact_sheets/BodilyInjury_0911.pdf.

Accident Fund Insurance: Ascertain secondary medical conditions (such as obesity and diabetes) from written workers' compensation claim notes. These conditions are predictive of which injuries will be high-cost so that, for example,

Fraud Detection

Transactions include:

- ▶ Invoices
- ▶ Credit card purchases
- ▶ Online activities
- ▶ Tax returns
- ▶ Telecom (calls)
- ▶ Checks
- ▶ Clicks (paid ads)
- ▶ Insurance claims



Citizens Bank:

Loss prevention up 20%
- or -
Prevention staff down 30%

A major automobile insurance carrier:

Predictive analytics delivers **6.5 times the fraud detection capacity** of that attained with no means to rank or score insurance claims.

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See also: <http://www.abbottanalytics.com/data-mining-case-study-1.php>

Fraud Detection

The National Insurance Crime Bureau says that **insurance criminals steal over \$30 billion annually**, making such fraud the second most costly white-collar crime in the United States - behind tax evasion - resulting in \$200 to \$300 of additional insurance premiums per U.S. household.

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Progressive Insurance Special Investigative Unit Report from the National Insurance Crime Bureau (NICB). www.progressiveagent.com/claims/special-investigations-unit.aspx.

Fast-Tracking Claims



Increased the fast-tracking of claims by
1,100% with predictive analytics

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James Taylor, JT on EDM, "Putting Predictive Analytics to Work at Infinity Insurance," DecisionManagementSolutions.com, September 15, 2009.
<http://jtonedm.com/2009/09/15/putting-predictive-analytics-to-work-at-infinity-insurance/>

James Taylor, "Putting Predictive Analytics to Work," Predictive Analytics World Washington, DC, Conference, October 19, 2009, Washington, DC.
www.predictiveanalyticsworld.com/dc/2009/agenda.php#day1.5

death-clock.org



14340 Days, 14 Hours, 37 Minutes, 13 Seconds...

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More on mortality prediction:

Solo rockers die younger than those in bands. Although all rock stars face higher risk, solo rock stars suffer twice the risk of early death as rock band members. This may be due to the fact that band members benefit from peer support and solo artists exhibit even riskier behavior (factoid courtesy of public health offices in the UK).

Men on the Titanic faced much greater risk than women. A woman on the Titanic was almost four times as likely to survive as a man. Most men died and most women lived. This may be due to the fact that priority for access to life boats was given to women.

Five Reasons Organizations Predict When You Will Die

1. Clinical medicine
2. Life insurance
3. Law enforcement and military predict kill victim
4. Safety institutes predict system failure casualties

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For more details, see the article, "Deathwatch: Five Reasons Organizations Predict When You Will Die":

<http://www.predictiveanalyticsworld.com/patimes/deathwatch-five-reasons-organizations-predict-when-you-will-die/>

Safety institutes: e.g., aviation accident mortality.

According to an industry poll, a growing number of life insurance companies go beyond conventional actuarial tables and employ predictive technology to establish mortality risk. They calculate when you are going to die.

This Atlantic article about gun violence prediction proposes a database that would lead the way to predicting offenses, including random killing sprees related to mental illness:

<http://www.theatlantic.com/politics/archive/2012/12/how-big-data-can-solve-americas-gun-problem/266633/>

... and is there prediction after death? It turns out that death is not the final event to be predicted for a life. The Chicago Police Department predicts whether a murder can be solved. The department found that characteristics of a homicide and its victim help predict whether the crime will be solvable.

Five Reasons Organizations Predict When You Will Die

5. A top-five U.S. health insurance company....
... predicts the likelihood an elderly policyholder will pass away within 18 months...
... in order to trigger end-of-life counseling, e.g., regarding living wills and palliative care.

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Beyond life insurance, one top-five health insurance company predicts the likelihood that elderly insurance policy holders will pass away within 18 months, based on clinical markers in the insured's recent medical claims.

For more details, see the article, "Deathwatch: Five Reasons Organizations Predict When You Will Die":

<http://www.predictiveanalyticsworld.com/patimes/deathwatch-five-reasons-organizations-predict-when-you-will-die/>

... and is there prediction after death? It turns out that death is not the final event to be predicted for a life. The Chicago Police Department predicts whether a murder can be solved. The department found that characteristics of a homicide and its victim help predict whether the crime will be solvable.

TAKE-AWAYS: Predictive Analytics for Insurance

- **Applies across a range of functions**
- **Complements standard actuarial methods**
 - Leverage ~~big~~^{wide} data
 - More types of models
- **The Data Effect**
- **The Prediction Effect**





Predictive Analytics World Conference

San Francisco • Boston
Chicago • Toronto
London • Berlin
Washington DC (Government)

Bigger wins!
Strengthen the business impact
delivered by predictive analytics.

www.pawcon.com

"Predictive Analytics World was probably the best analytics conference I have attended... turned into my new must-go-to conference."

Dennis Mortensen
Director of Data Insights
Yahoo!

PAW March 2012 drew 500 attendees. PAW has included case studies from: AT&T, Aflac, Amazon.com, Amway, Anheiser-Busch, BBC, Barclays, Blue Cross, BoA, Citibank, Fidelity, GE Capital, Google, HP, HSBC, Infinity, Intuit, LinkedIn, Macy's, Match.com, MetLife, Microsoft, NRA, Netflix, Orbitz, Overstock.com, PayPal, Reed Elsevier, Target, The Economist, US Bank, US Bank, Wells Fargo, YMCA, Yahoo! and many more.

**INSURANCE INDUSTRY SESSIONS AT
PREDICTIVE ANALYTICS WORLD 2014**

See the following few slides

PAW Toronto (May 2014)

Case Study: *Workman's Safety Insurance Board*

Discrete Time Logistic Hazards Models for Workplace Safety Insurance On-Benefit Duration Models

The safe and timely return to work for an injured worker is a key priority for Workers' Compensation. Using predictive models, we understand the key risk factors affecting the time on-benefits and determine the probabilities being on benefits at different time points. Although most injured workers experience a single off benefit event, some may experience a recurrence for the same injury after returning to work. We use discrete time logistic hazards regression to model on-benefit and off-benefit durations. The probability of being on-benefit at a point in time is then calculated using the Markov transition probabilities from the above models.

Dragos Daniel Capan, Statistician, Corporate Statistics Division, Workplace Safety Insurance Board

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<http://www.predictiveanalyticsworld.com/toronto/2014/agenda.php#day1-1125a>

More information about Predictive Analytics World: www.pawcon.com

PAW Toronto (May 2014)

Expert Panel:

The Future of Predictive Analytics in Insurance

The insurance industry has always embraced analytics. Through the actuarial discipline, techniques have been employed that allow companies to charge policy premiums which more accurately reflect risk. But advancements in predictive analytics methods and technologies are rapidly raising the stakes. Here, our panelists discuss how they're using predictive analytics in their pricing strategies. Data challenges and how organizations have overcome them to more fully leverage predictive analytics will be discussed. Attend as our experts examine what lies ahead for organizations that truly embrace predictive analytics as part of their corporate DNA.

Panelists:

[Barb Addie](#), President, Baron Insurance Services

[Jamie McDougall](#), Vice President, Personal Insurance Solutions, Gore Mutual

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<http://www.predictiveanalyticsworld.com/toronto/2014/agenda.php#day2-215>

More information about Predictive Analytics World: www.pawcon.com

PAW Chicago (June 2014)

Case Study: *AIG*

Predictive Analytics in Insurance

This case discusses the use of predictive analytics to evaluate professional service firms, make the right in-source/outsource decision, and develop strategies to improve the delivery of professional services. Attend and learn how savings were realized by the better matching professional service needs with professional service providers, and how the decision to in-source resulted in a measurable financial impact.

[Domenick DiCicco](#), SVP, Head of Global Claims Litigation, AIG

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<http://www.predictiveanalyticsworld.com/chicago/2014/agenda.php#day1-445a>

More information about Predictive Analytics World: www.pawcon.com

PAW Chicago (June 2014)

Case Study: TD Insurance

Improve Customer Satisfaction with a Predictive Model

Session description forthcoming

[Dominic Fortin](#), Senior Manager, Forecasting & Analytics, TD Insurance

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<http://www.predictiveanalyticsworld.com/chicago/2014/agenda.php#day1-510a>

More information about Predictive Analytics World: www.pawcon.com

PAW Boston (October 2014)

The inaugural Predictive Analytics World for Healthcare will include insurance cases. The program is TBA and will be posted soon; see:

www.pawcon.com/health

More information about Predictive Analytics World: www.pawcon.com

ALREADY PASSED: PAW San Francisco (March 2014)

Case Study: *A Top 3 P&C Provider in Japan*

Digital Lead Optimization in Insurance

In this session, we present the development and implementation of a real-time digital lead aggregator optimization engine for a major global P&C carrier. We cover the technical difficulties and constraints the team faced and the solutions we developed. Moreover, we discuss how we achieved alignment across the supply and demand side of the aggregator/lead ecosystem. Result: The insurance carrier was able to reduce cost by 40% while maintaining 90% of conversion by eliminating, in real time, unproductive leads. The online lead suppliers were able to expand the available universe for selection, which lead to greater overall spending.

[Anamitra Chaudhuri](#), Senior Director, Insurance Analytics, Merkle

[Yanni Kotziagkiaouridis](#), Vice President, Analytics Strategy Practice Lead
Insurance and Wealth Management Analytics, Merkle

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<http://www.predictiveanalyticsworld.com/sanfrancisco/2014/agenda.php#day2-415b>

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91% of attendees rated
the instructor
Excellent or Very Good

P PREDICTION **IMPACT**

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"Thank you for the perfect
introduction to predictive analytics.
It's just the right blend of a business
and technical angle I was looking for."

—Emiliano Pasqualetti,
CEO, DomainsBot Inc.



businessprediction.com

**To Learn More:
The Predictive Analytics Guide**

www.pawcon.com/guide

Predictive Analytics World

