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Business Process Simulation for Claims Transformation

Beth Riczko, Westfield Insurance
Melissa Marshall, Westfield Insurance
Mark Grabau, IBM

Business Process Simulation for Claims Transformation

Agenda

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Business Value	Analyst's Perspective	How To

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Westfield's Advanced Analytics Journey

Beginning to 2006

- Launched a Business Intelligence program
- Built a Business Intelligence roadmap that is focused on meeting strategic business needs
- Built an enterprise data warehouse
- Established data governance policies, processes and working teams

2007 to 2009

- Focused on delivery of descriptive statistics to end users
- Established the Analytics Resource Center with a center of excellence for analysts in business units
- Migrated to a centralized model with a group analytics leader responsible for analytics

2010 to Present

- Began working with IBM on various advanced analytics projects
- Focused projects on meeting two objectives: addressing business needs (roadmap) and expanding analytical skills through experience
- Purchased predictive analytics, simulation, and optimization tools

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Available techniques and capabilities informs the level of analytical maturity

What do we want to be?   How do we get there?

Prescriptive Analytics — high

Stochastic Optimization
How can we achieve the best outcome including the effects of variability?

Optimization
How can we achieve the best outcome?

Simulation
What could happen?

Predictive Modeling
What will happen next if?

Forecasting
What if these trends continue?

Alerts
What actions are needed?

Query/Drill Down
What exactly is the problem?

Ad Hoc Reporting
How many, how often, where?

Standard Reporting
What happened?

Predictive Analytics

Descriptive — low

Complexity

Adapted from Competing on Analytics, 2007

Breakaway — high

Optimizing

Practicing

Developing

Aware

Business Advantage — low

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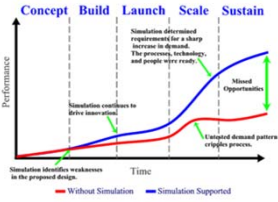
What Is Simulation and Why Do Insurers Need It?

- Simulation is a well-established method for process planning and reengineering because it captures the variability and uncertainty in complex systems
- **The Flaw of Averages**: Average Inputs do not equal Average Outputs.
  - Unlike management solutions with spreadsheets that are often based on averages, or static workflow diagrams, simulation captures the end-to-end interdependencies and variability among processes and resources.
- Simulation also allows different strategies to be studied in a low-cost, risk-free environment prior to implementation

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Slide 6

What Is Simulation and Why Do Insurers Need It?

Simulation Measures:
- Time waiting
- Service time

Balance

Customer Experience

Staffing/ Resources

Process Performance

Simulation Measures:
- Total # needed
- Utilization

Simulation Measures:
- Cycle time
- Throughput

- Simulation results in better requirements, better ideas, and more successful implementations
  - o Avoid costly mistakes by making decisions based on gut feel or static modeling
  - o Changes to planning factors can be simulated to show benefits of policy changes
  - o Test system changes under realistic conditions before implementing on live operations or customers
  - o Reveal value and eliminate wasteful bottlenecks in existing processes
  - o Test drive new business rules
  - o Compare alternative system designs
- Ultimately, make better decisions with more insight on business system processes

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Slide 7

Case Study: Monte Carlo Simulation for Agency Profit Sharing Accrual

Business Challenge

- Westfield had established a process to pay agencies based on their performance.
- In addition, agencies are tiered based on their historic premium volume and performance.
- Westfield accrues funds to cover the annual payout using overall company performance each month.
- Routinely overbooked with a 20% error
- Objective: Reduce the error to under 5%
- In addition, Westfield wanted to reduce the maintenance required to estimate the accrual during an annual refresh

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Slide 8

Case Study: Monte Carlo Simulation for Agency Profit Sharing Accrual

Solution

- We built a Monte Carlo simulation that modeled the historic performance of each agency's prior year's written premium, the loss ratio, and the annual premium growth rate using statistical distributions.
- The statistical distributions were shifted systematically using a design of experiments in order to account for uncertain future scenarios.
- A multivariate regression equation was fit to the results of the experiments.

Benefits

- The error rate was reduced to less than 3%.
- The equation takes seconds to implement in a spreadsheet and produce an estimate of the accrual.
- More rigorous sensitivity and what-if analyses have been conducted due to the ease of use of the equation.
- The model can be refreshed in less than 1 business day by a novice user.

x_1 x_2 x_3

$$Model \\ f(x)$$

y_1 y_2

5.26 ±0.04

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Case Study: Claims FNOL and Assignment Simulation

Business Challenge

- Westfield is undertaking a replacement of the legacy claims system.
- We have several business process and staffing changes we are considering.
- However, we had no way to test their options prior to implementation.
- In addition, we had a number of hypotheses about the quality and effectiveness of our current process, including one that said were at least one day slower in assigning claims than other companies.
- Finally, we needed to know the impacts of implementing predictive analytics at various points in the process.
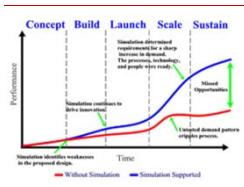
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Case Study: Claims FNOL and Assignment Simulation

Solution

- Through process mapping workshops and site visits, we mapped the process from FNOL to Adjuster Assignment including staffing, workflow, business rules, arrival patterns, and processing times.
- Using the process maps as the model specification, we built a business process simulation that modeled the As-Is process.
- Once the simulation was verified and validated, our laundry list of To-Be scenarios was tested and compared to the As-Is baseline.
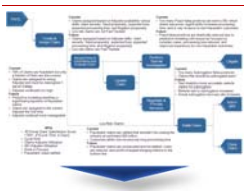
Benefits

- Simulation outputs and analyses of historical cycle time data demonstrated we were already assigning claims in less than a day.
- Several instances of anecdotal evidence that would have sidetracked the system implementation were identified and unsubstantiated with factual data analyses.
- An option that was taken out of consideration was tested with the simulation and proved to have a significant, positive impact on the cycle time to process the claim. The option was subsequently added back to the requirements.
- Several process and staffing changes were identified that didn't require capital investments or a new system.
- The process maps are being used to guide system implementation and for on-boarding new staff.

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Simulation at Westfield

- Completed
  - o Agency Profit Sharing
  - o FNOL to Assignment
  - o Billing

- In-Process
  - o FNOL to Settlement (Guidewire Implementation)
  - o SIU

- Upcoming
  - o Underwriting

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Business Problem

- Large scale replacement of legacy Claims management system

- Significant process changes

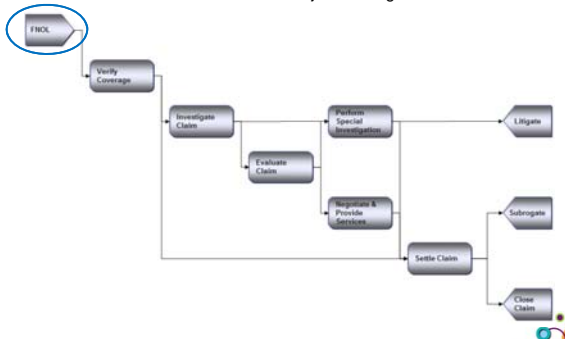- Strategic decision support needed for assessing and prioritizing proposed changes

Approach

- Simulate from First Notice of Loss to adjuster assignment

Approach (cont.)

IBM.

- Partnered with IBM

- Process mapping
  - Initial mapping with experts
  - Site visits
    - Claims entry vendor
    - Regional claims office/service office
  - Guest for a day
    - Customer Care Center
  - Recorded phone calls
    - After hours call vendor

Approach (cont.)

IBM.

- Data collection/cleansing
  - Claims entry vendor resource allocation
    - Designated, not dedicated
    - Manager monitors for 3 per hour, minimum standard
  - Adjuster assignment though e-mail
    - Mining text for keys

Approach (cont.)

IBM.

- Data collection/cleansing (cont.)
  - Anomaly analysis for storms
    - "It's difficult to determine when we are actually in a storm situation"
      – Arrival patterns different by day of week
      – Volume of claims different by type (Auto, Liability, Property)
      – Seasonal patterns (more property losses in the summer)
    - Used SPSS anomaly cluster model to flag and remove anomaly days for average weekly arrivals
      – Number of claims
      – Day of week
      – Claim type
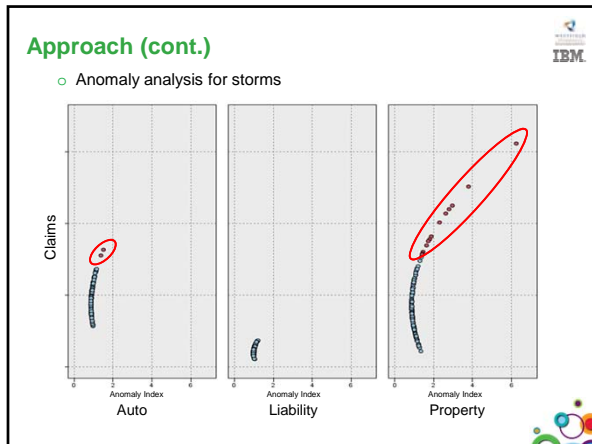   – Month of year

Approach (cont.)

o Anomaly analysis for storms

Approach (cont.)

- Additional data collection benefits (besides simulation)
    - o Provide insight where none previously
    - o Investigate anecdotal evidence

- Kept leadership engaged during build
    - o Delivered nuggets at weekly meetings
    - o Key decision makers never missed a meeting

Approach (cont.)

- Claim entry to email delay
    - o Anecdotal evidence is that this takes hours
    - o Email attachments needed for adjuster assignment
    - o Most of the time this occurs within 15 min., almost all in 1 hr.
    - o Actual vs. reported behavior

Approach (cont.)

- Schedule verification

Claims

Entry time

Time of day

Approach (cont.)

- Email arrival to adjuster assignment
  - ~30% of claims sent to be assigned during off hours

Email Arrival Hour, Mon-Fri Only

Claims

4 pm - 9 pm

FNOL Simulation Model Demo

Simulation Lessons Learned

IBM.

- First time modeler
    - o Underestimated verification, validation, and data prep time
    - o Skeptical of validation being possible
- First-hand experience from site visits resulted in better modeling of claims entry vendor and customer care center hybrid resources
- Coding standards
    - o 1 to 1 mapping to process maps
    - o Parallel builds
    - o Trace reports read like a book (block labels)
    - o Conducting experiments
    - o Flexibility to add or bolt on
- Confidence delivering briefings
    - o "Yeah, but how do you know it's accurate?"
    - o Power of knowledge after completion was awesome

Simulation Results

IBM.

- Cycle time in hours vs. days
- Automated assignment reprioritization
- Split shifts for adjuster assignment
- Claims entry vendor refocus
    - o Email delay
    - o Entry time
- Fewer phone inquiries
- Channel switch implications
    - o Information collected on phone vs. fax
    - o Cycle time vs. accuracy of assignment

Next Steps

IBM.

- Run experiments for adjuster assignment to claim closure simulation
- Customer Care Center billing
    - o Hybrid resources
- Special Investigation Unit (SIU)

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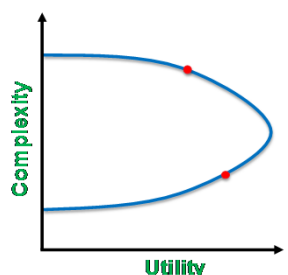
Balancing Utility versus Complexity
Simulation is designed to achieve a reasonable tradeoff between real world complexity and model utility.

Complexity / Utility

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Academic Foundation Training

IBM BAO University

Introduction	1.5 hrs
Review of Basic Probability, Statistics, and Queuing Theory	1 hr
Building Valid, Credible, and Appropriately Detailed Models	1 hr
Selecting Input Probability Distributions	1 hr
Output Analysis	1 hr
Random Numbers and Variance Reduction Techniques	1 hr
Steps of a Successful Simulation Study	0.5 hrs
In-Class Case Study	1 hr

Simulation Tool Training

Arena Environment	1 hr
Basic Modeling Concepts	1 hr
Modeling Constructs	1 hr
Examples and Coding Standards	1 hr
In-Class Exercises	4 hrs

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Components of a Simulation Model

Entities + **Processes** + **Resources** + **Business Rules** = **System**

- Objects that move through a model
- What gets processed
- Each entity is unique and can have attributes

- E.g. Claims or Features

- Represents the actions that are preformed on entities
- Can take time and make changes to a entity's attributes

- E.g. Verify Coverage or Make Payment

- Commodity of limited supply needed by entities for some process.
- Entities take turns using the resource with some entities waiting for their turn in a queue

- E.g. Adjuster or CSR

- Guidelines, rules or instructions that determine how entities move through a business process
- Govern the operation of the resources

- E.g. Reserve Approval Thresholds or Assignment Logic

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Defining Success in a Simulation Study

"In the best scenarios, a successful simulation project is one that delivers useful information at the appropriate time to support a meaningful decision."

Decision

Timing   **Information**

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What does it take?

Skills and Knowledge Needed

Non-Negotiables	Soft Skills
• Mastery of statistics • Understanding of randomness • Firm grasp of the system to be studied • Model at an appropriate level of abstraction • Programming-type skills • Graphics design for animation • Skill with data management tools • Software tool familiarity • Project management experience • Corporate politics adeptness • An eye for detail	• Interviewing skills • Negotiating expertise • Discipline; keeping sight of the project goals • Selling your work • Listening skills ("hearing between the lines") • Organizational skills • Technical writing • Time management mastery • Ability to communicate with many constituents • Pragmatic project scheduling talent

Simulation Analyst

Where are the potential landmines?

Wrong Problem	Right Problem, Wrong Time	Data	Opportunity
• Simulating to justify / prove what is already decided • "When you have a hammer…" • Biting off more than can be effectively analyzed	• Too early • Too late	• "My system has too little data" • "My system has too much data" • "My system's data is just right … but I don't know what it means!" • "I need my data now!!!"	• Getting lost in details • Waiting too long to start analysis • Having too much fun with animation • Leaving the debugging for when the model is complete

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Verification and Validation

"One of the most important problems facing a real-world simulator is that of trying to determine whether a simulation model is an accurate representation of the actual system being studied...."

Verification — The process of ensuring that the (conceptual) model design has been transformed into a computer model with sufficient accuracy or **building the model right**.

Validation — The process of ensuring that the (conceptual) model is sufficiently accurate for the purpose at hand or **building the right model**.

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Steps to Success

Formalize Specification	Manage the Project	Use Reviewers	What If?
• Obtain sign-offs on objectives • Identify data requirements early • Agree on system scope • Plan for animation	• Schedule milestones for each component • Hold regular review meetings • Be realistic—build in time for getting data, doing runs, and verifying	• Structured walk-through • Deliver concise project summaries to decision-makers • Review specifications, data, model logic, animation, etc.	• Be willing to adapt to changes • Test all efforts against project objective(s) • Look for new ideas • Use sensitivity analysis to find "hot points"

Claims Simulation Project Timeline

Typically a 3-4 month project!

	Week 1	Weeks 2-5	Weeks 6-9	Weeks 10-13	Weeks 14-15
Activities	• Initiate Project • Understand Available Data • Finalize Project Plan	• Conduct Process Mapping Workshop • Conduct Process Map Validation Workshop • Conduct Future State Workshop	• Build Simulation Model • Verify Simulation Model • Validate Simulation Model	• Create Experiment Plan • Run Experiments • Analyze Experiment Results • Run Other Experiments	• Analyze All Experiment Results • Create Prioritized List of Initiatives • Produce Final Report • Present Results
Deliverable	Project Plan	Process Maps	Simulation Model	Experimentation Results	Final Report/ Presentation

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Questions?

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