The Fully Automated Ratemaking Process

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Today’s Speaker

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I am a...

Can't find a job? Browse the full list

Find out my automation risk > 33%

Automation in Insurance

But what about pricing? What is our transformative breakthrough?
Agenda

- Why now?
- Which technology?
- What process to automate?
- Who does the work?
- How do I get past the roadblocks?

Automation is more than just “cost savings”

“What’s the primary focus of process improvement efforts for the time periods below?”

Cost reduction used to be the main driver

2 years ago

Cost reduction: 32%

Improve worker productivity: 22%

Improve customer experience: 16%

Regulatory compliance: 14%

Accelerate digital business transformation: 13%

Now

Cost reduction: 33%

Improve worker productivity: 32%

Improve customer experience: 16%

Regulatory compliance: 12%

Accelerate digital business transformation: 7%

2 years from now

Cost reduction: 33%

Improve worker productivity: 32%

Improve customer experience: 16%

Regulatory compliance: 8%

Accelerate digital business transformation: 7%

Source: Forrester’s Q1 2018 Digital Process Automation Survey
Benefits of Automation

- Reduce rating error
- Reduce manual processes
- Create transparency and auditability
- Increase process execution speed
- Stronger compliance and governance

Why should we care about pricing automation?

“Automation will lead to competitive advantage”
## Technology

### Tools & Technology

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
<th>Best Use</th>
<th>Longevity / Scope</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBA</td>
<td>Visual Basic for Applications (used for MS products)</td>
<td>Converting data in Excel to be ingested into a tool with a different format</td>
<td>Legacy technology</td>
<td>$</td>
</tr>
<tr>
<td>SAS</td>
<td>Full scope software suite with long history</td>
<td>Complex data transformations over large datasets</td>
<td>Persistent, but declining</td>
<td>$$$$</td>
</tr>
<tr>
<td>Python</td>
<td>Open source scripting language</td>
<td>General purpose coding outside of core operating systems</td>
<td>Rapid growth</td>
<td>$</td>
</tr>
<tr>
<td>RPA</td>
<td>Robotic process automation</td>
<td>Purely process automation to replace human “clicking”. Good for legacy systems.</td>
<td>Good adoption, maturing quickly</td>
<td>$$</td>
</tr>
<tr>
<td>IPA</td>
<td>Intelligent process automation; combining RPA, NLP, and Machine Learning</td>
<td>Great at automating complex tasks that mimic human thought and have an automated feedback loop</td>
<td>Lots of hype, not much adoption</td>
<td>$$$</td>
</tr>
<tr>
<td>Auto ML</td>
<td>Automated machine learning</td>
<td>Fitting statistical models</td>
<td>Slow growth</td>
<td>$$</td>
</tr>
<tr>
<td>NLP</td>
<td>Natural language processing</td>
<td>Transitioning between language and code</td>
<td>Losing momentum</td>
<td>$$</td>
</tr>
</tbody>
</table>

No one tool can do everything. You need the right tool for the right job.
What technology is just hype?

- Auto ML
- Intelligent Process Automation
- Natural Language Processing
- Robotic Process Automation

Gartner Hype Cycle for Artificial Intelligence, 2019
When you start automating your pricing process, will you like what you see?

If you don’t love your process today, you are not going to love it tomorrow.

**Breaking the Process into Simple Steps**

1. Data Management
2. Modeling
3. Create Rating Structure
4. Factor Selection
5. Deployment
6. Monitoring
7. Rate Testing
8. Filing
Poll Question
How would you classify your overall pricing process?

- Best in class; everything we want
- Great process, but could be modernized
- Very manual process; rates rebuilt multiple times
- Needs to be rebuild from the ground up

Poll Question
Over the next 5 years, what % of your current pricing process could be automated?

- 0 – 10%
- 10 – 25%
- 25 – 50%
- 50 – 75%
- 75%+

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Poll Question

What is your number 1 challenge in the pricing process?

- [ ] Prone to rating errors
- [ ] Slow speed to market; processes
- [ ] Technology restrictions
- [ ] Translating models into rating structures
- [ ] Too many cooks in the kitchen; management

Breaking the Process into Simple Steps

- Data Management
- Modeling
- Create Rating Structure
- Factor Selection
- Deployment
- Monitoring
- Rate Testing
- Filing
Internal vs. External Data

Is it easier to automate internal or external data?

Working with Structured Data

- Bring analytical data closer to production data
- Data should be unified across the in force, quote, and testing datasets
- Many data processes are already automated, but there is much room for improvement
**Automating Data Management**

**Actions to Automate**
- Extraction | Standardization | Validation | Merge/append | Import/export

**Technology**
- Python | SAS | SQL | Other commercial data tools

**Required Skills**
- Data engineer

**Technical Notes**
- Most important step of the automated pricing process
- Consolidate automation processes as much as possible
- Unify (standardize) all data required in the pricing process
- Strong partnership between IT and Actuarial

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**Breaking the Process into Simple Steps**

- Data Management
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- Create Rating Structure
- Factor Selection
- Deployment
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- Filing
Models Used in Pricing

Models to automate:

- Retention & mid-term cancelation (semi-annual update)
- New business conversion (quarterly update)
- Expense allocation (annual update)
- Loss cost (annual update)
  - Constrained models (include market & regulatory constraints)
  - Unconstrained models (true best estimate of loss)

Can we use Machine Learning models for calculating premium?

Not a question of ‘IF’, but ‘WHEN’

Automating Model Development

**Actions to Automate**
- Refit with updated data | Identify new data elements | Adjust transformations
- Compare models

**Technology**
- Python | AutoML (DataRobot)

**Required Skills**
- Data scientist | Predictive modeler | Statistician

**Technical Notes**
- Models should be created manually first
- Machine Learning always beats traditional GLMs – statistically speaking
- Just because we can build more complex models, does not always mean that we should
- Building models is easy; deploying them into production is much more difficult
Breaking the Process into Simple Steps

- Data Management
- Modeling
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- Filing

Creating Rate Tables

- Current Rates
- Table 1
- Table 2
- Table 3

Two options for creating rate tables:

1. OPTION 1: Use same structure and replace factors
   - Table 1
   - Table 2
   - Table 3
   = $

2. OPTION 2: Create new rating tables with new factors
   - Table 1
   - Table 3
   - Table 4
   = $

Ingredients for fitting models (data)
Automating Rating Structure Creation

**Actions to Automate**
- Transform loss cost models | Group factors | Add tables outside GLM | Rerate data as audit

**Technology**
- Python | AutoML | Specialized commercial software

**Required Skills**
- Data scientist | Actuary | Product management

**Technical Notes**
- The handoff today between R&D and pricing today is typically ugly
- Consider what steps in this process truly add value today
- Creating an overly complex rating structure to hide IP from competitors rarely works
- How the structure is created is a function of the rating engine flexibility

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Breaking the Process into Simple Steps
## Automated Factor Selection

### State Product Filing

<table>
<thead>
<tr>
<th>Var</th>
<th>Current</th>
<th>Indicated</th>
<th>Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>L2</td>
<td>1.10</td>
<td>1.21</td>
<td>1.15</td>
</tr>
<tr>
<td>L3</td>
<td>1.25</td>
<td>1.38</td>
<td>1.32</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

From current rate pages | From new loss models

### The automated factor selection process

Leverages the expected profitability and underlying expectation of customer demand:

1. Define the objection function (business goal to maximize)
2. Define the global constraint (anchor)
3. Define individual factor level constraints (selected factor should be between current and indicated)
4. Define relationships between rating cells (monotonicity constraint)
5. Run algorithm to compute optimal factors that are compliant with regulation

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## Automating Factor Selections

### Actions to Automate

- Adjust factors by considering market position, regulatory constraints, and customer demand

### Technology

- Python | Specialized commercial software (optimizer)

### Required Skills

- Actuarial | Product management

### Technical Notes

- Within predefined criteria, algorithm finds a factor combination that satisfies all constraints
- In practice, suggested factors are the starting point for human adjustment
- Selected factors should always be accompanied by KPI projections
- In the perfect process, the only input needed is the business objective (growth vs. profit)
Breaking the Process into Simple Steps

Data Management → Modeling → Create Rating Structure → Factor Selection → Deployment → Monitoring

Rate Testing

Analytical Tools for Pricing and Modeling

Owned by the Business

Deployment Hand-off

Live Rating Engine Tool

Owned by IT

Customer Quote

Rate and Model Deployment

Current State:

Pricing and Modeling

Owned by the Business

Single Unified Platform

Live Rating Engine

Owned by the Business

Customer Quote

Ideal State:
Automating Rate Deployment

**Actions to Automate**
- Perform system checks | Request permissions | Implement rates into rating engine

**Technology**
- Python | RPA

**Required Skills**
- IT | Actuarial

**Technical Notes**
- This is handoff is currently one of the largest bottlenecks in the pricing process
- Shifts responsibility from IT to business and allows greater speed to market (proactive vs reactive)
- Reduces deployment time from months or weeks to days or hours
- This is mission critical – no mistakes here

Breaking the Process into Simple Steps

- Data Management
- Modeling
- Create Rating Structure
- Factor Selection
- Deployment
- Monitoring
- Rate Testing
- Filing
Automating Rate Filing

Actions to Automate
- Compile rate pages | document changes | Output current/indicated/selected factors | Submit filing

Technology
- Python | NLP | VBA | RPA | IPA

Required Skills
- Actuarial | Product management

Technical Notes
- Like all filings, it is a balance of how much vs. little to share – for automation, share more
- Be open with the regulators that you are focusing on automation; include them in the process
- Different states will have different templates (that’s ok)
- How comfortable would you be to let IPA (using NLP) attempt to answer objections?

Breaking the Process into Simple Steps

Data Management → Modeling → Create Rating Structure → Factor Selection → Deployment → Monitoring

Filing → Rate Testing
End-to-End Rate Testing

Front-line premium validation in Analytical Environment

Automated testing module using production rates and models

Premium (and breakdown) returned from production automatically fed back into Analytical Environment

Analytical Environment

Selected Rates and Models

Data preparation

Data for Analysis

Testing Environment

Selected Rates and Models

Data Simulation

Data for testing

Production Environment

Deployed Rates and Models

Production Data

Request Profile from Policy Admin System

Capture Quote Data

Automated Feedback Loop

Automating Rate Testing

Actions to Automate

• Validate premiums | Check system performance | Identify discrepancies | Notify stakeholders

Technology

• Python | RPA | IPA

Required Skills

• Actuarial | IT

Technical Notes

• At most companies, this piece of the process needs to be reinvented
• Rate tables and pricing rules should be programmed once and deployed everywhere required
• Testing data should be – in force, new business quotes, synthetic extreme cases
• The most important test is looking at average premium levels and distribution
**Breaking the Process into Simple Steps**

- Data Management
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- Filing

**Automating Monitoring**

**Actions to Automate**
- Rebalance data
- Check predictive model accuracy
- Notify stakeholders
- Trigger corrective action

**Technology**
- Python
- SAS
- SQL
- IPA

**Required Skills**
- Data engineering
- Data science

**Technical Notes**
- Overlooked step in many business processes – lots of talk with little action
- The first step is to create automated output for reporting
- Most challenging part of the process – lots of if/then scenarios
- Very few business processes are able to close the loop through complete process automation
Implementation

Roles & Responsibilities

• Management sponsor: executive level setting the course
• Process owner: line of sight over the end-to-end pricing process
• Project manager: orchestrator keeping track of deliverables, resources, and timeline
• Technical experts:
  • Business experts – actuaries intimately familiar with the pricing process
  • Data experts – data engineers who know how to find the right data
  • Technology experts – know how to use automation tools

Ideally you have more people doing the work than managing the work
Navigating the Challenges

“When there are boulders, we can either chip away, go around, or blow them up!”

Key takeaways

- Love the process before you automate it
- Break the process down into bite-size pieces
- Increase process execution speed
- Stronger compliance and governance
- Create transparency and auditability

Most importantly…
I am a…

Actuary

Can’t find a job? Browse the full list

Find out my automation risk > 21%

Process automation is a journey

Walk  Run  Leap!
Questions?

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Thank You
Transforming Culture & Operational Technologies

Introduction

• About Us
• Desired Skillsets
• Automation Projects

Agenda
Julia Hart

• Site Director, DigitaLab (3 years)
• Adjunct Faculty, University of Illinois School of Information Sciences
• University of Illinois Alumni (Masters & Doctorate)
• Previously Director of IT and Institutional Research
• Lived in Champaign, IL for 34 years!
Our Vision:

To Enrich Lives in the Communities We Serve

Delivering Working Solutions

- AppDev & Technology Enablers
- Business App Design & Development Utilizing Emerging Technologies
- Modeling & Insights Automation Self-Service
- Data & Analytics
- Research & Innovation POCs & Prototypes Collaboration Opportunities

Successes

- Established Culture
- Variety & Volume of Projects
- Quick Turnaround
- Cross-Discipline Approach
- Relationships with Faculty and Industry
Our Vision:
To Enrich Lives in the Communities We Serve

Challenges

- RESOURCES (FTE)
- TECHNOLOGY STACKS
- OPERATIONALIZING
- ACCESS TO DATA & TOOLS
- DELAY IN TIMELINES

University of Illinois Talent
Skillsets

- Out-of-the-box thinking
- Emerging technologies
- Agile methodologies
- Ambition & Initiative

Out-of-the-Box Thinking

- Ability to learn domain-specific knowledge
  - At least have an interest
- Non-prescriptive
- Be creative!

“I assume all this playing will lead to innovation.”
Latest Tech

- Data Science specific:
  - Computational Skills
    - Programming Languages
    - Databases
    - Machine Learning
- Data Visualization
  - Storytelling
  - Interactive Dashboards
  - Analytical Reports

Agile Approach

- Understanding various project management methods
  - Agile vs. Waterfall
  - Sprints
  - Tracking User Stories
- Adaptable to change
Self-Starter & Communicator

• Ability to work in a team or independently
• Effectively communicate with stakeholders
• Desire to take a concept from idea to product

DigitаЧаІ is a place of diversity, where we can fully utilize our creativity & what we’ve learned in classes to create some real value. It’s happy to see the tools we developed to be deployed in the production environment and used by COUNTRY. This feeling of being needed makes me love DigitaLab even more.

DigitаЧаІ Intern, 2020
Project Results

- Property Image Recognition
- Sentiment for Data Analysts
- Claims VOC App
- NLP to Query

Property Image Recognition 2.0

- Google Cloud Vision API vs. Azure Cognitive Services
- Created an **automated** solution using historical images and claims data to assess risk of insuring a house
Sentiment for Data Analysts

Easy-to-Use Web App
Generates Predictive Model
Predicts Text Sentiment (Specific Context)

No Data Science Background Needed!

Claims VOC App

Claims application was aimed at automating the evaluation of a customer’s claim experience.

Machine learning technique random forest was used to rank features affecting low ease scores.

Inclusion of reports uncovering details about crucial metrics enabled quick evaluation and analysis of claims data.
• Country Financial currently utilizes skilled employees having knowledge of Query Languages to answer basic questions asked by Business Users

• This project aims to create a robust system that is responsible for automating the process of answering questions by converting English sentences to SQL Queries

• The successful implementation of this project will make this entire process more efficient, less time-consuming and inexpensive.

Thank you

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