



# Dynamic pricing

Evolving in a changing market with analytics  
and machine learning

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# Introductions



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# How to improve your financial performance

## Data

- Accuracy and amount of internal data collection
- External data utilization
- Competitive intelligence

## Analytics

- Sophistication of tools and techniques
- Predictive modeling talent
- Dynamic pricing using robust decision support

## Technology & Execution

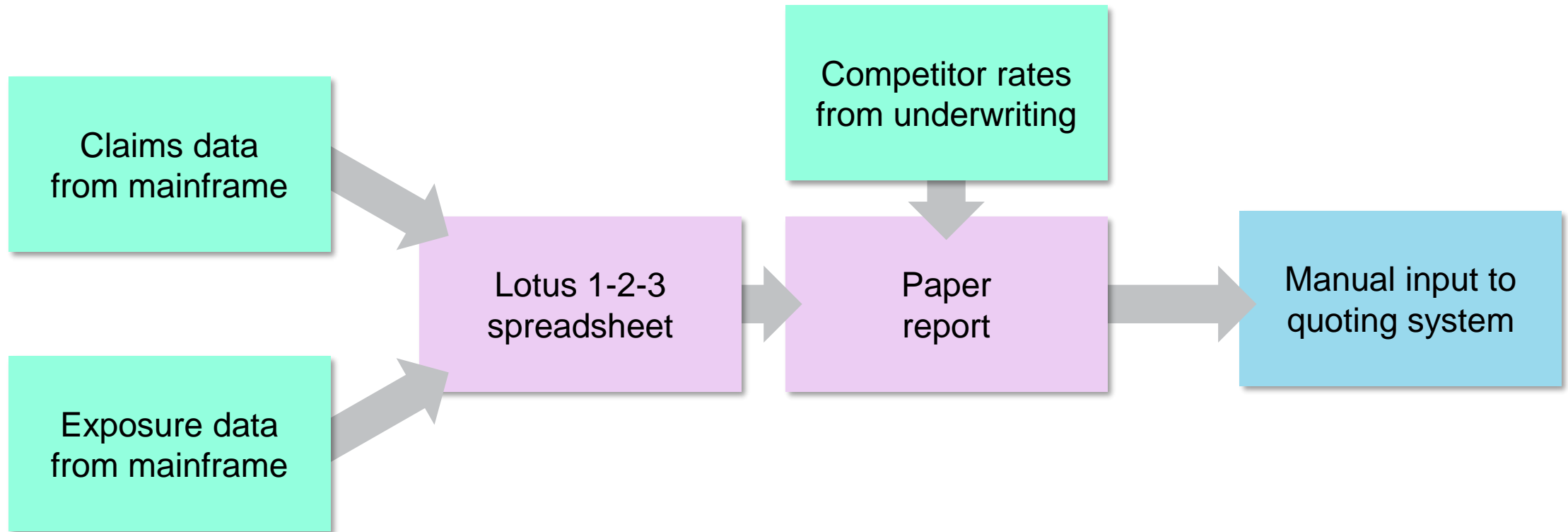
- Maximizing data usage
- Effective rate deployment
- Automation

## Polling question

**What parts of your company's pricing are you automating? (select all that apply)**

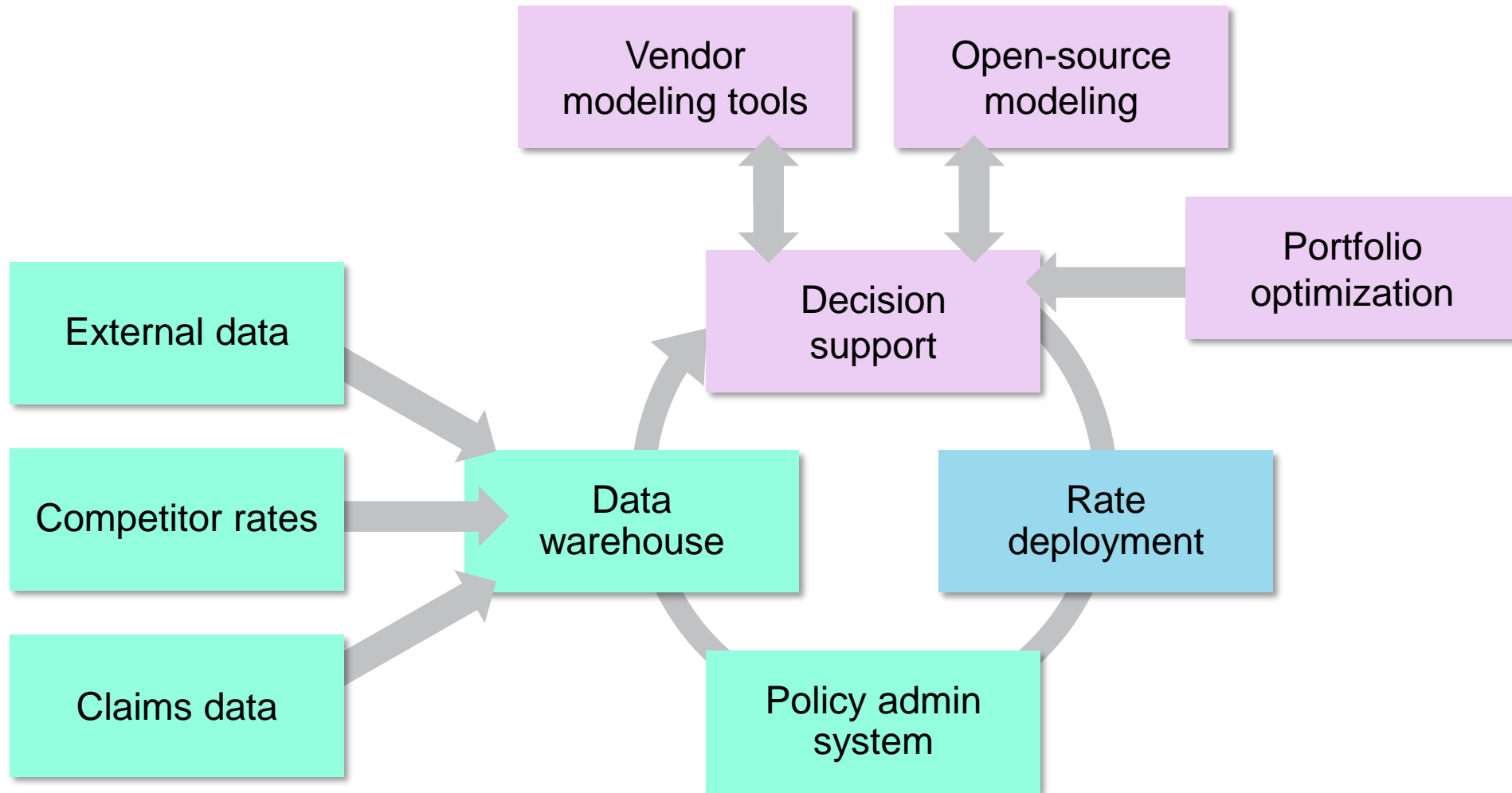
- A. External data
- B. Predictive modeling
- C. Internal data collection
- D. Decision support
- E. Deployment

## The 1990 Pricing Cycle



Process would take 6 - 9 months

# The Dynamic Pricing Cycle



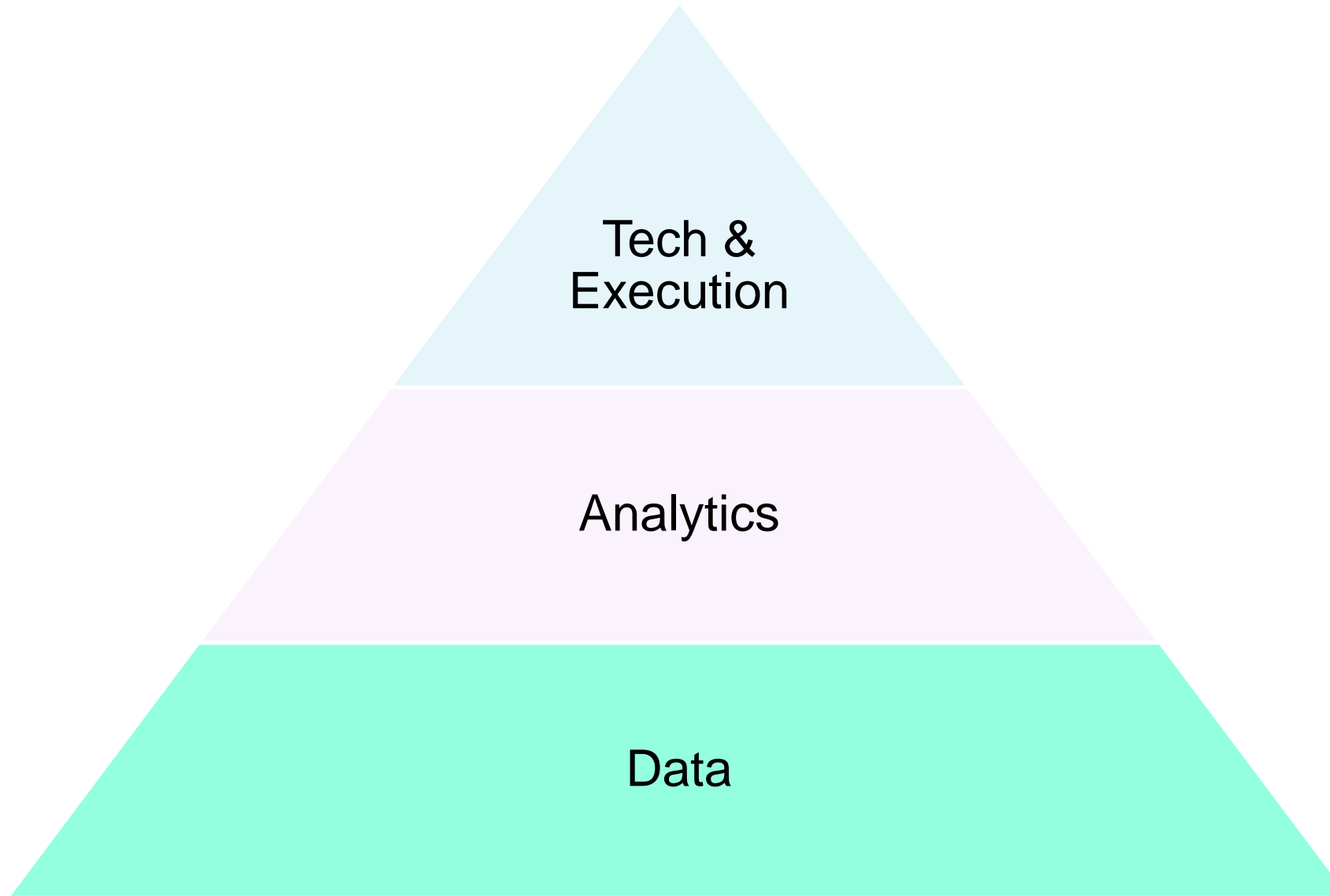


# Data

- Accuracy and amount of internal data collection
- External data utilization
- Competitive intelligence

# Data remains foundational

## DATA





## Data remains crucial...

...yet key challenges prevent companies from becoming more data-driven

- IT/information services bottlenecks/lack of coordination
- Infrastructure/Data warehouse constraints
- Data volume/quality/reliability
- Data accessibility
- Integration of disparate data sources
- Lack of sufficient staff to analyze data



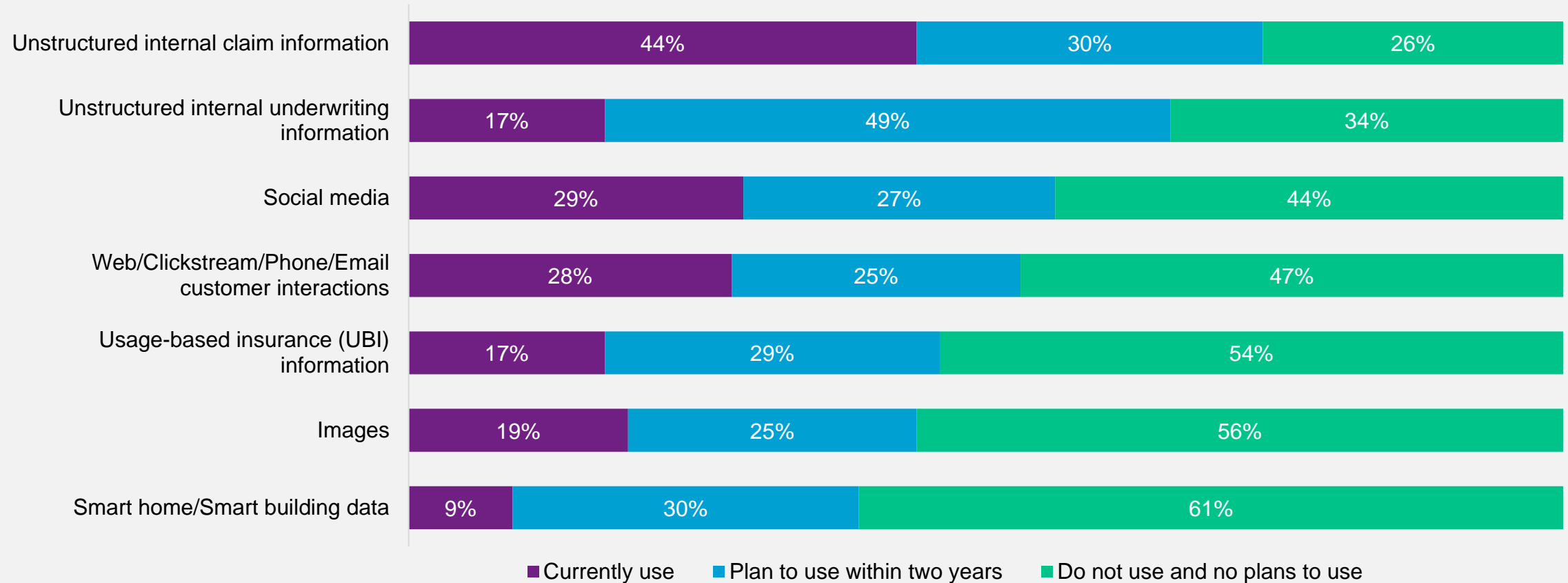
In the quest for better quality data, companies continue to invest heavily to address these challenges

## Polling question

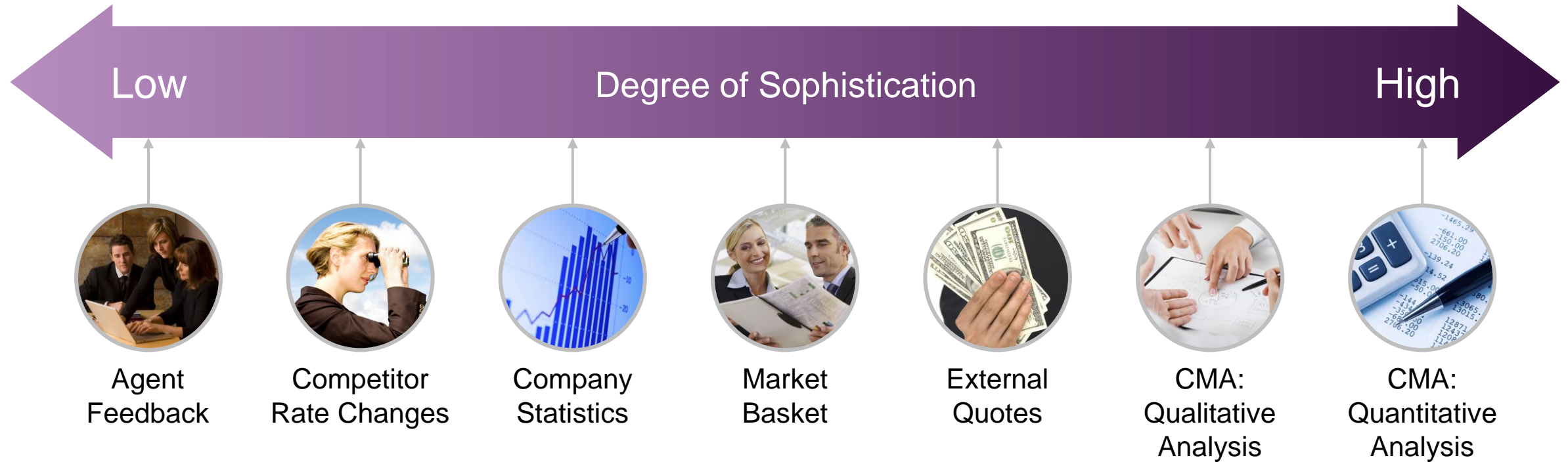
What types of non-traditional data are you using? (please choose all that apply)

- A. Unstructured internal claim information
- B. Unstructured internal underwriting information
- C. Social media
- D. Web/clickstream/phone/email/customer interactions
- E. Usage-based insurance (UBI) information
- F. Images
- G. Smart home/smart building data
- H. Other

## Growth in non-traditional data sources



## Sophistication of competitor data





## Analytics

- Sophistication of tools and techniques
- Predictive modeling talent
- Dynamic pricing using robust decision support



## Polling question

What predictive modeling techniques are you using? (select all that apply)

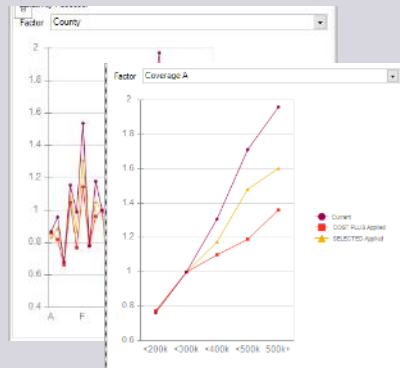
- A. Generalized linear models (GLMs)
- B. Gradient boosting machines (GBMs)
- C. Classification and regression trees (CART)
- D. Random forest (RF)
- E. Penalized regression methods (e.g., lasso, ridge, elastic net)
- F. Neural networks
- G. Other

## Simplicity vs. sophistication

### Equation-based vs. decision tree algorithms

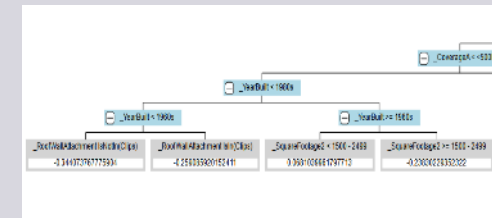
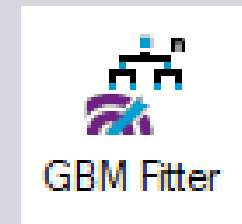
#### Equation-based

- Rating algorithms represented by combining relativities from various combinations of characteristics
  - Easily understood by distribution channels, customers and regulators
  - Difficult to introduce too much sophistication – limited by the closed form equations



#### Decision trees algorithms

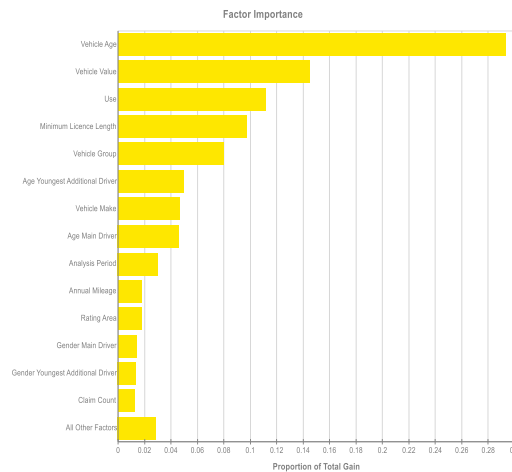
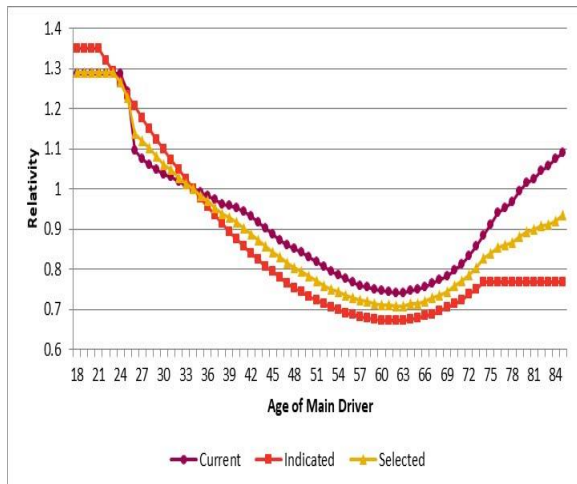
- Decision Trees (CART vs. GBM vs Other)
  - Segmentations are more easily represented but dependent on tree depth and number of rounds
  - Difficult to explain
  - IT challenges to integration into the policy administration systems
  - Greater tendency to overfit



## Using advanced analytics to improve results

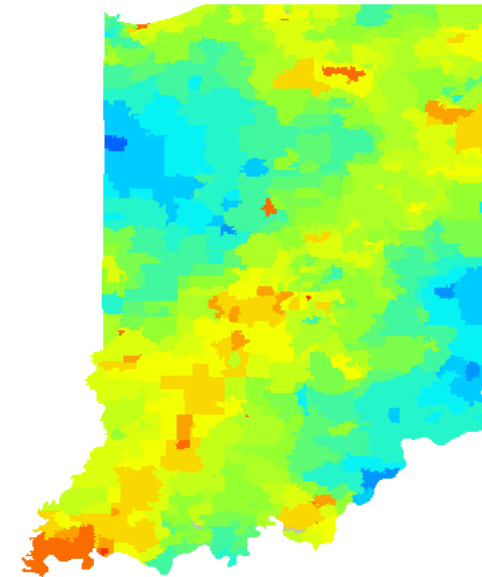
### Streamlining factor selection using GBMs

- GBMs are used to prioritize the variables to be studied using the traditional approach, e.g., the 20% of rating factors for which the current relativity is furthest from the indication



### Geodemographic information with rapid feature selection

- Apply penalized regression to homeowner's pricing data that was enriched with geodemographic information to identify which of these variables are most predictive

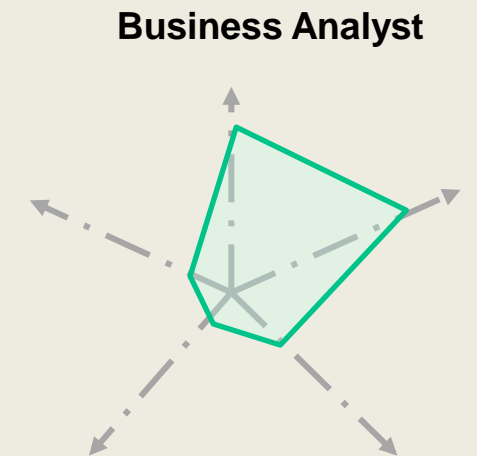
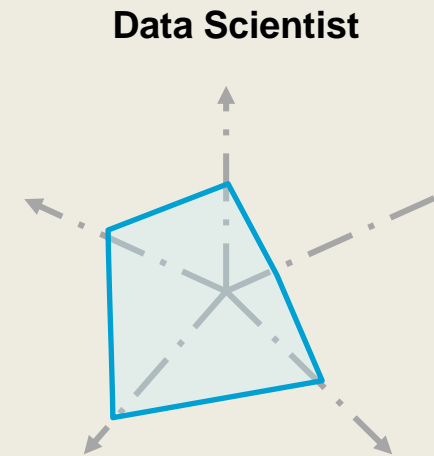
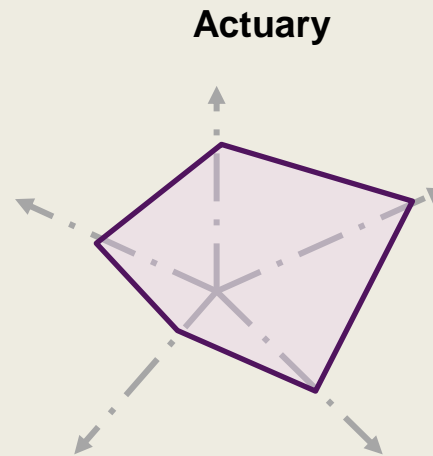
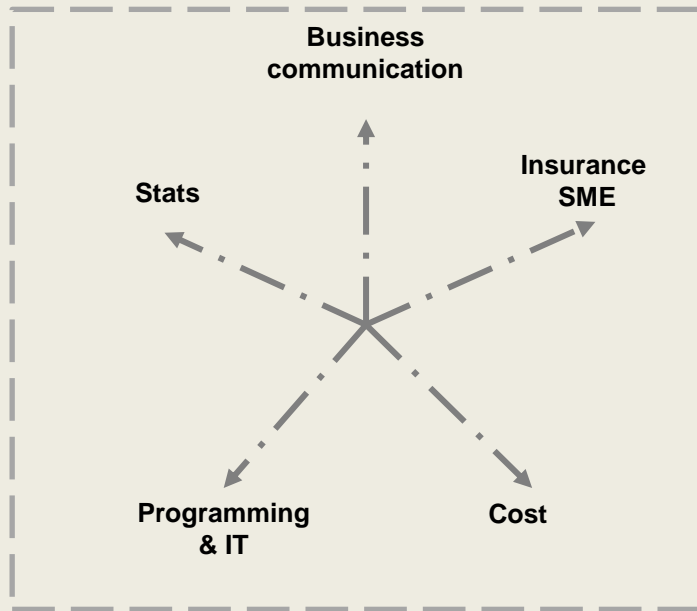


## Using advanced analytics to improve results

- **Problem:** Ensemble models outperform additive model forms such as GLMs; however, GLMs excel at interpretability and are understood by regulators.
- **Application:** Ensemble models (e.g., gradient boosted tree models) outperform additive models (GLMs and GAMs) by approximating complex relationships including high-order interactions. We can characterize these interactions in ensemble models and use them to improve GLMs. We can also directly identify interactions through saddle detection. Both methods are proven to improve GLM performance in rating.

# Roles in an analytics team

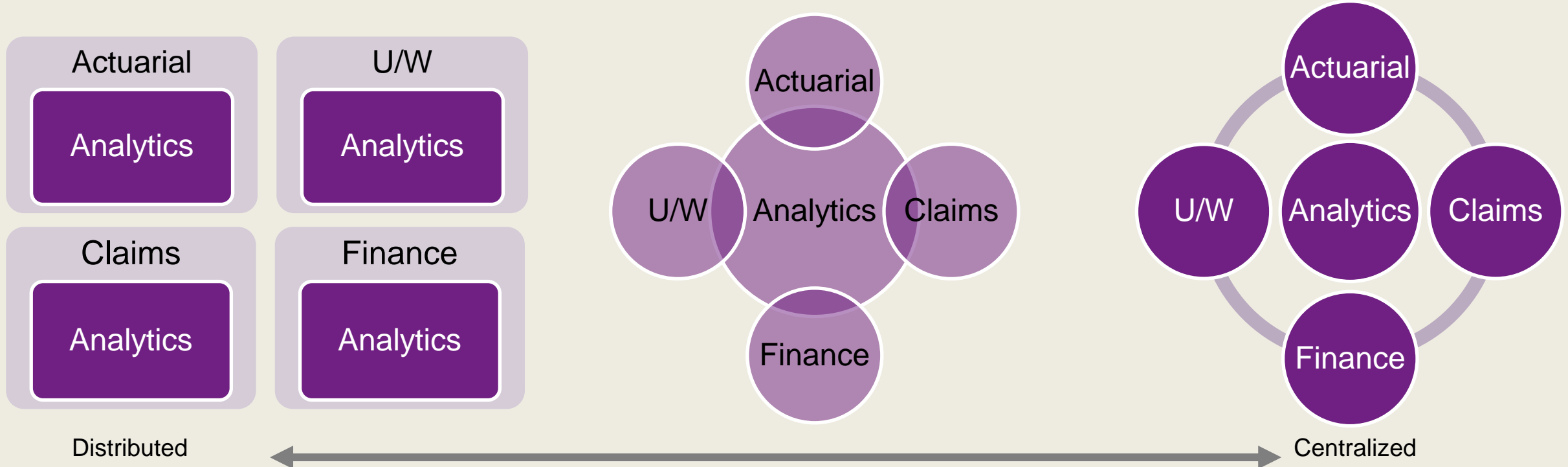
## Roles



Successful collaboration between several different disciplines is essential

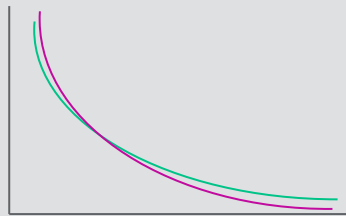


## Structure of the analytics function



## Benefits of integrating dynamic pricing

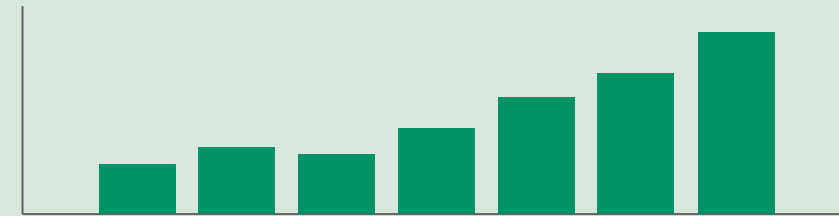
### Scenario testing



%	\$	Δ
%	\$	Δ
%	\$	Δ

- Understanding the expected impact from a given change in price
- Maximize value of the book through more enhanced risk selection and pricing sophistication

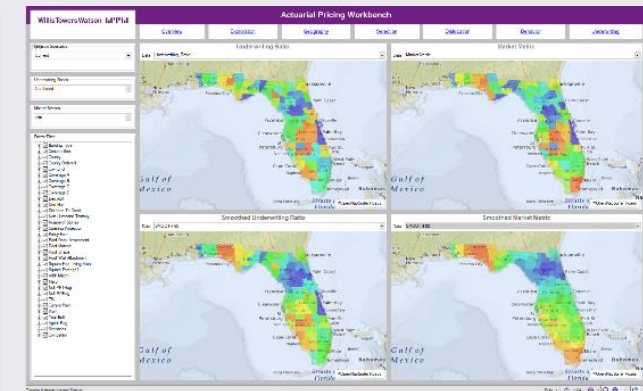
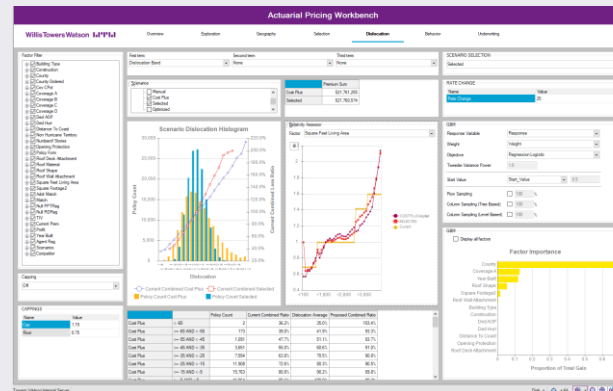
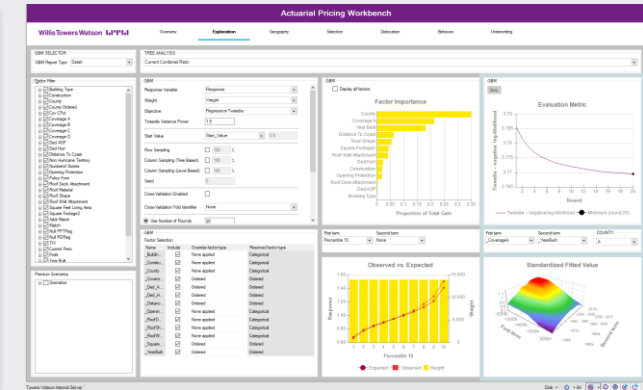
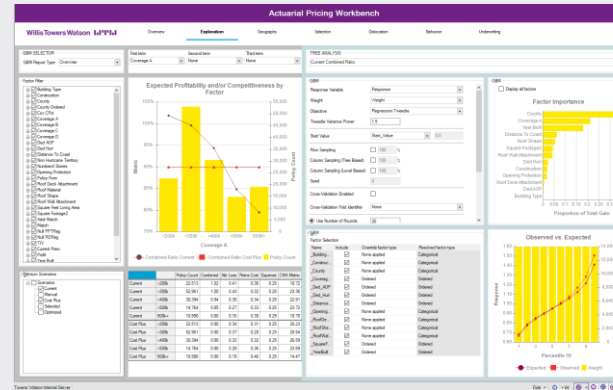
### Future planning



- Understanding of expected outcomes over a given time horizon
- Identifying future expected issues and opportunities

# Key ingredients to the decision support framework

- Prospective assessment of possible scenarios in an interactive environment
- Key performance measure
- Segmentation assessment
- Distributional assessment



# Technology & Execution

- Maximizing data usage
- Effective rate deployment
- Automation



# Technology has been evolving

## Legacy

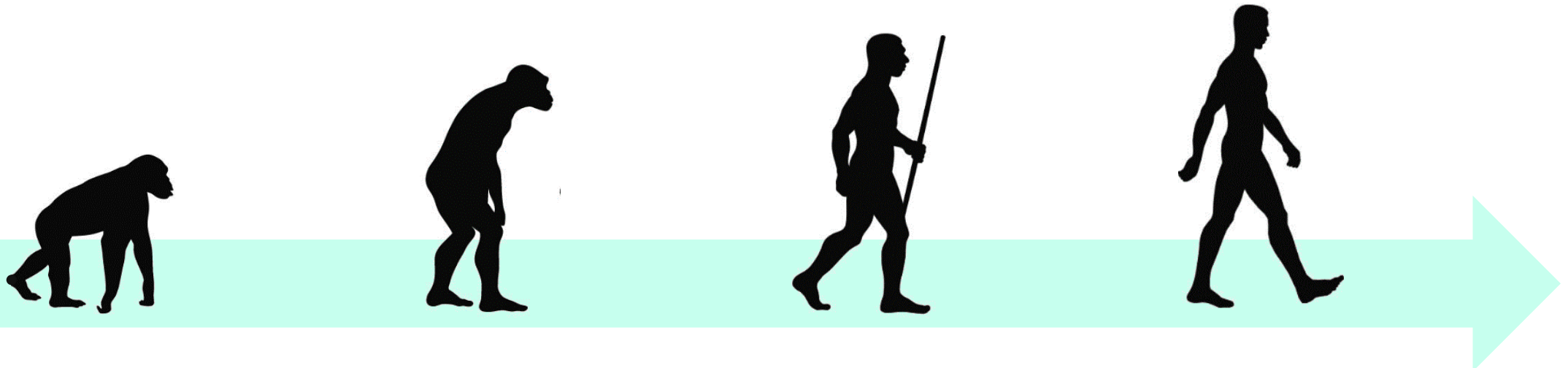
- Individual reviews and decisions
- Inconsistent application
- Variable data capture

## Platform Upgrade

- Rules based solution and improved consistency
- Richer structured data capture
- Strong external interfaces (API)
- Reduced rekeying
- Basic process automation

## Automation

- Sophisticated decision engine
- Leveraging structured, unstructured data and third-party data
- Complex process automation





## Technology leads to much broader data capture

- **Recording and processing of telematics** from a diversity of connected “things”
- Estimated **30 Billion** connected devices
- **Complex data streams** can be merged and fused with encyclopedic and contextual information.
- Ongoing issue: **Cyber security** defenses are typically weaker in lower cost IoT devices due to design economics and lower available processing and storage capacity

## Tech levers to improve pricing implementation

### Speed to Market & Efficiency

- Increased agility of pricing and portfolio management
- From MI to decision to execution in a matter of hours
- Significant cost reduction through effective, rapid and accurate delivery of rates

### Pricing Sophistication

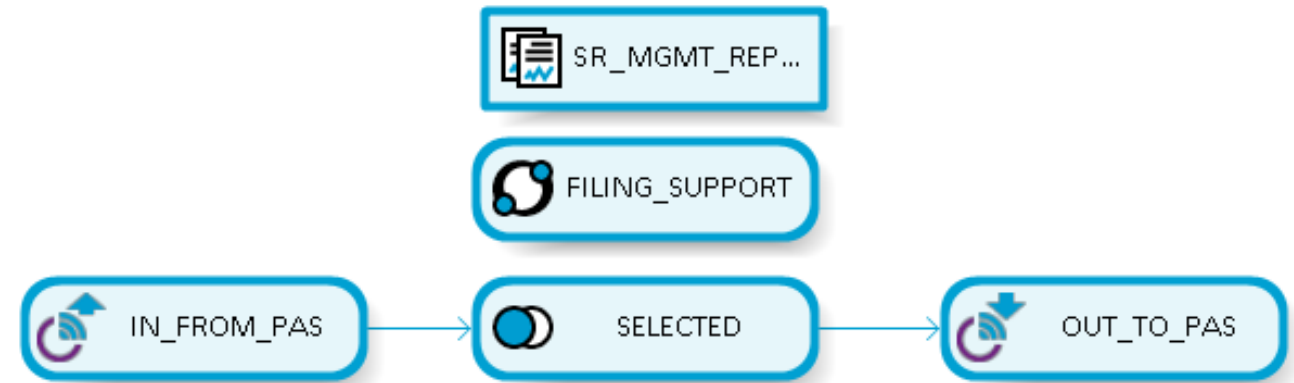
- Enhanced profitability from sophisticated pricing decision support
- Implementation of complex predictive models
- Eliminates need to simplify analytics to fit system constraints

### Ease of Integration

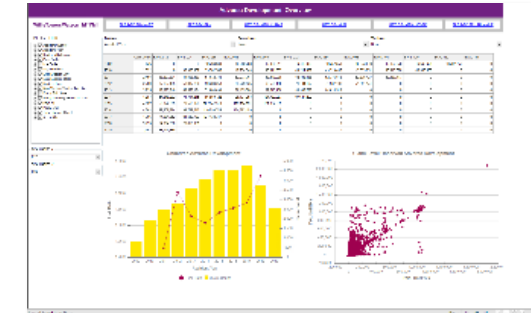
- Sophisticated solution able to integrate with any Policy Administration System
- Support required for multi-channel distribution
- Need support for live quoting and fast rate implementation

# Automation enables pricing delivery without constraint

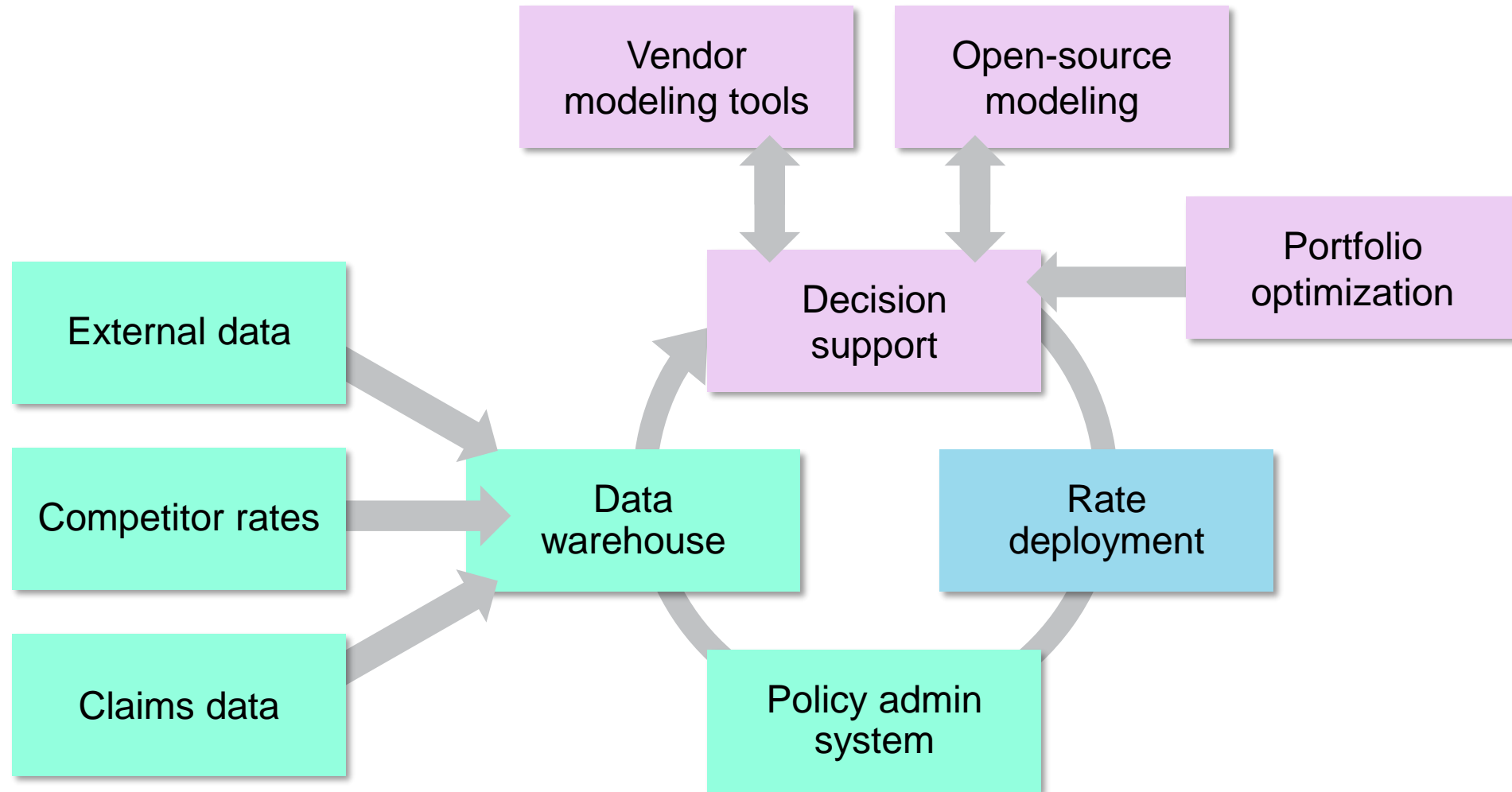
- Standardize senior management reporting
- Streamline filing support packages
- Integrate with policy administrations systems
- Pre-schedule the running of processes



XX Insurance Company Private Passenger Auto State XY Exhibit X: Indicated and Selected Rates				
Exposure Description	Class Code	Current Rate	Selected Rate	Rate Change
A	1.0%	1,000	1,000	0.0%
B	1.0%	1,000	1,000	0.0%
C	1.0%	1,000	1,000	0.0%
D	1.0%	1,000	1,000	0.0%
E	1.0%	1,000	1,000	0.0%
F	1.0%	1,000	1,000	0.0%
G	1.0%	1,000	1,000	0.0%
H	1.0%	1,000	1,000	0.0%
I	1.0%	1,000	1,000	0.0%
J	1.0%	1,000	1,000	0.0%
K	1.0%	1,000	1,000	0.0%
L	1.0%	1,000	1,000	0.0%
M	1.0%	1,000	1,000	0.0%
N	1.0%	1,000	1,000	0.0%
O	1.0%	1,000	1,000	0.0%
P	1.0%	1,000	1,000	0.0%
Q	1.0%	1,000	1,000	0.0%
R	1.0%	1,000	1,000	0.0%
S	1.0%	1,000	1,000	0.0%
T	1.0%	1,000	1,000	0.0%
U	1.0%	1,000	1,000	0.0%
V	1.0%	1,000	1,000	0.0%
W	1.0%	1,000	1,000	0.0%
X	1.0%	1,000	1,000	0.0%
Y	1.0%	1,000	1,000	0.0%
Z	1.0%	1,000	1,000	0.0%



# The Dynamic Pricing Cycle



## Conclusion

Improving your financial performance relies on these key levers:

Data

Analytics

Technology and Execution

Superior performance and execution in these areas will maximize your growth and profitability.



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