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AI middle office empowers long term value creation by actuaries

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AI middle office empowers long term value creation by actuaries

Tiger Li
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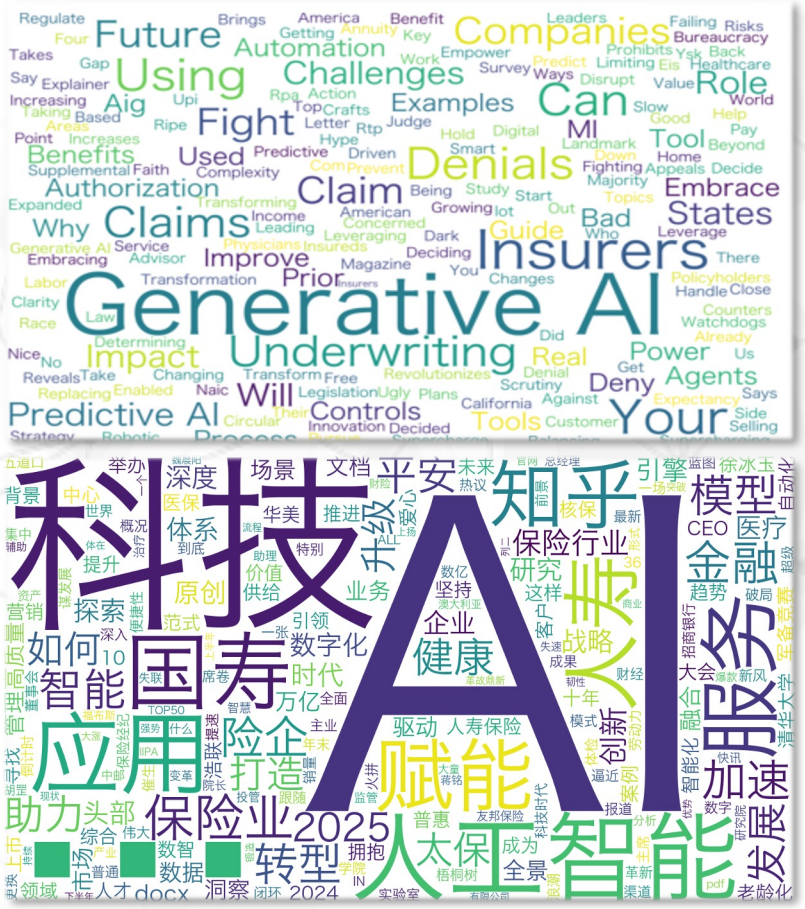
Generative AI Advances Rapidly
Actuaries Must Accelerate the Adoption of Predictive AI also



- ✓ **Generative AI dominates** insurance discourse
- ✓ Industry focus is **skewed toward generative use cases**.
- ✓ Balanced innovation requires renewed emphasis on **Predictive AI**

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Generative AI Advances Rapidly
Actuaries Must Accelerate the Adoption of Predictive AI also

Predictive AI vs. Generative AI

Comparison Dimension	Predictive AI (Structured Data)	Generative AI (Unstructured Data)
Data Type	Processes structured data (e.g., tables, databases)	Processes unstructured data (e.g., text, images, audio)
Application Tasks	Prediction, classification, scoring, risk control	Generative text, images, conversations, code, etc.
Common Models/Algorithms	Logistic Regression, Decision Trees, XGBoost, etc.	GPT, GANs, Diffusion Models, Multimodal Models, etc.
Model Characteristics	Clear structure, simple algorithms	Complex models, strong generative capabilities
Interpretability	Results are easy to understand and explain	Results are creative but difficult to interpret
Typical Use Cases	Finance, retail, manufacturing, etc.	Content creation, intelligent customer service, AI design, code generation, etc.

✓ **"Traditional AI" → Skilled at judgment → Similar to "Analyst/Actuary"**

✓ **"Generative AI" → Skilled at expression → Similar to "Creator"**

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Generative AI Advances Rapidly
Actuaries Must Accelerate the Adoption of Predictive AI also

Have life and health insurance companies already:

established systematic, large-scale adoption of "Traditional AI,"

fully leveraging structured data?

- **Systematic: From standalone AI engines to a modular matrix of AI capabilities**
- **Large-Scale: Big data, many engines, wide applications, rapid iteration**
- **Full Use of Structured Data: Maximizing structured data—more volume, more completeness, ongoing growth and adaptation**

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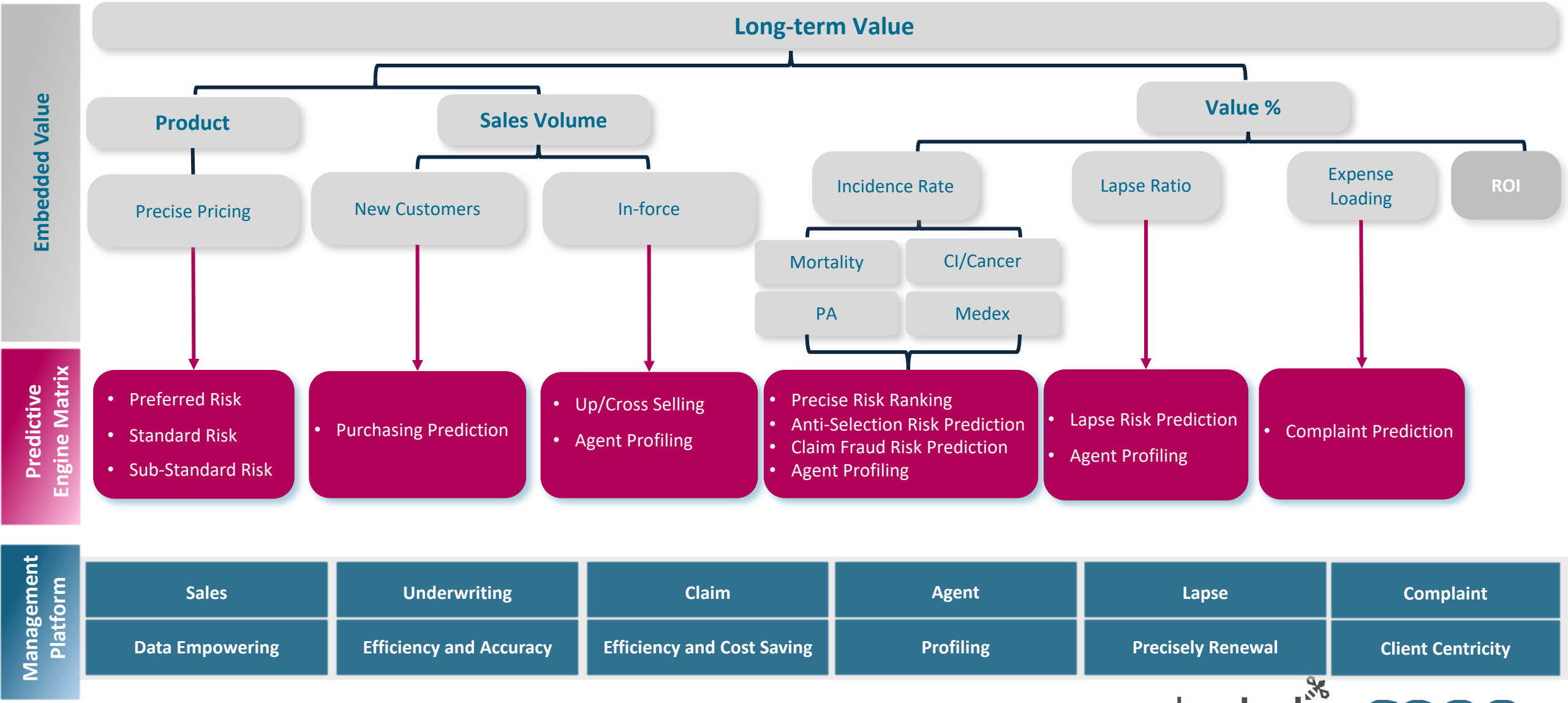
01

Predictive AI Engine Structure

Create Long-term Value for Life and Health Insurers



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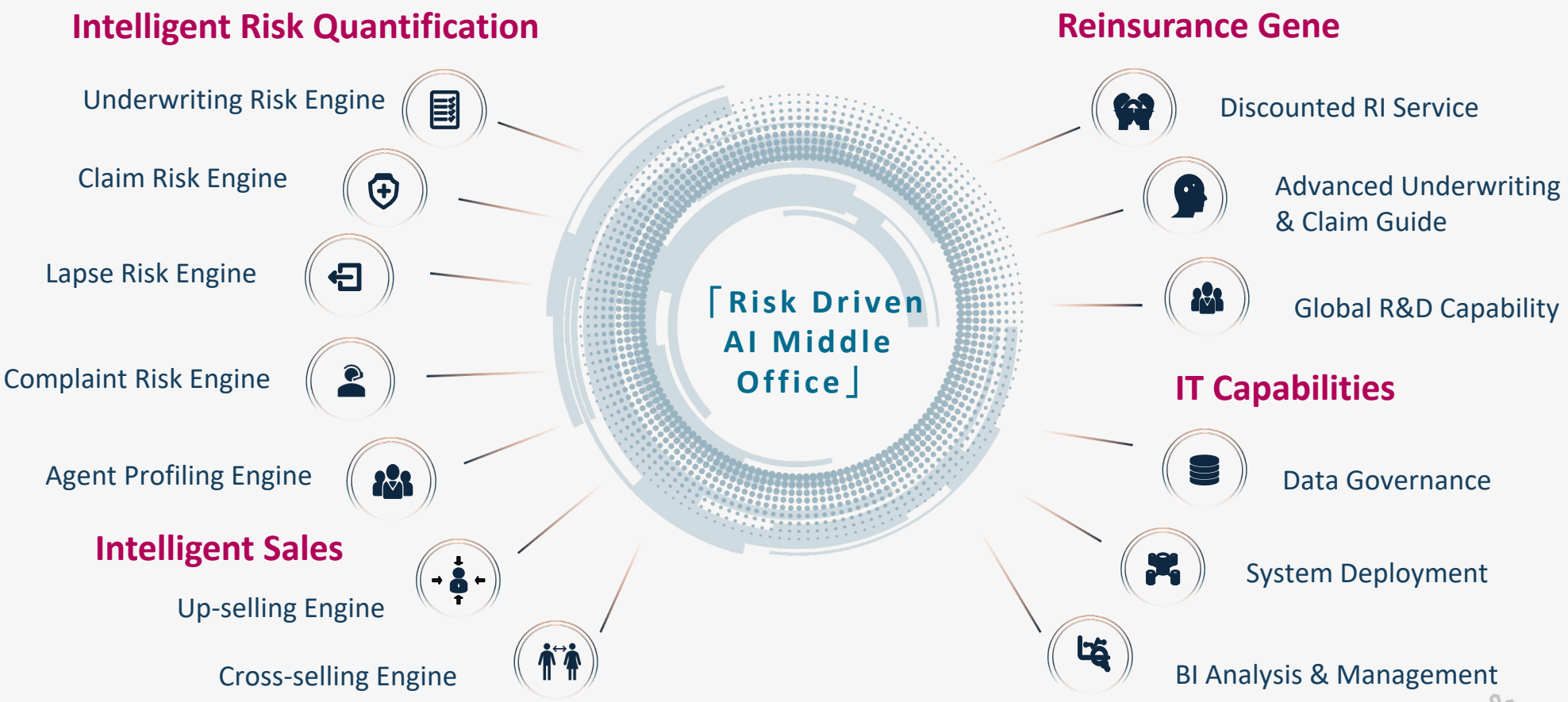
Predictive AI Engine Matrix: Empowered by AI, Big Data and Risk Knowledge

Risk Driven AI Middle Office Through the Predictive Engine Matrix



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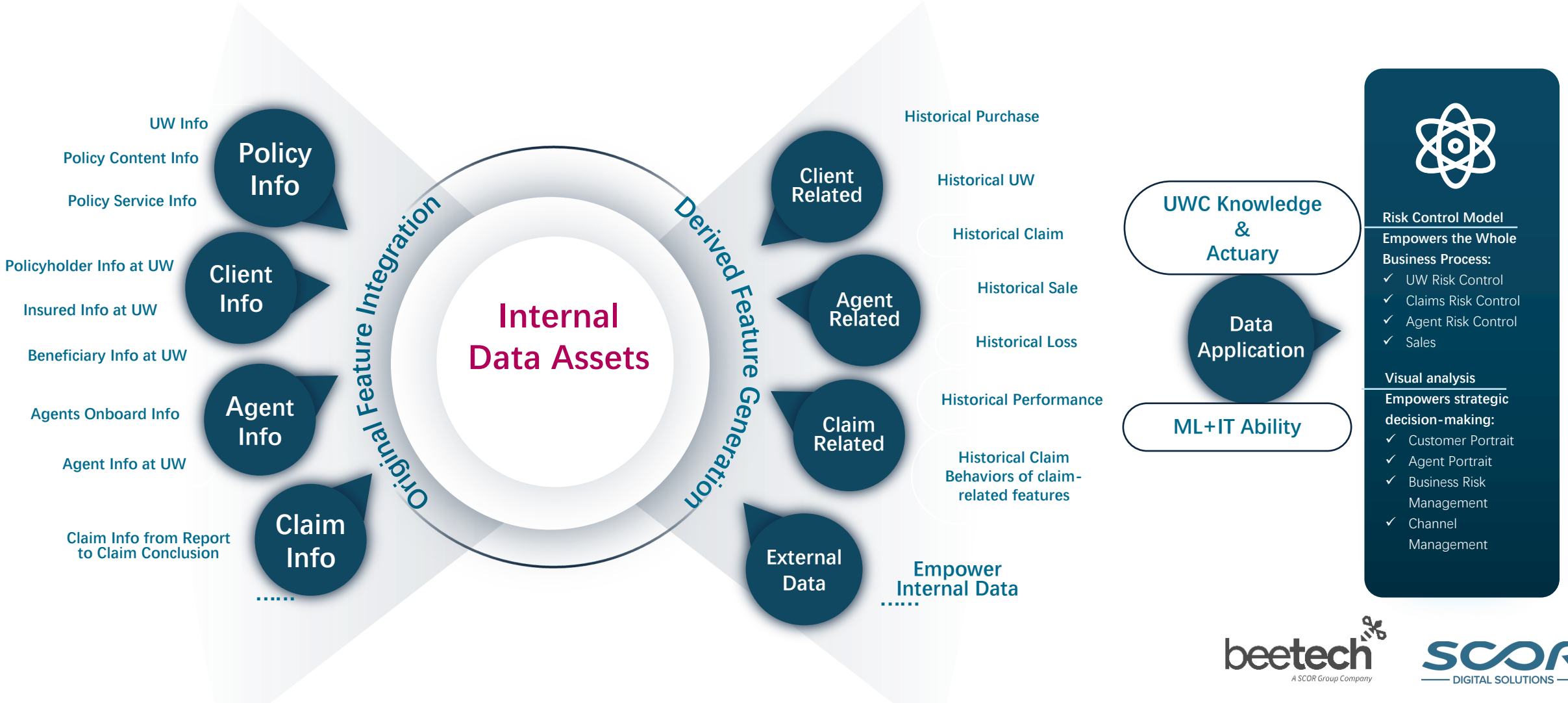
Integrate Multi-dimensional Data Within The Insurer To Realize The Value of Data Assets

Business to Data → Data to Assets → Assets to Value



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02

Underwriting Risk Predictive Engine

UW Risk Engine Case 1 – ranking the risk to operate more efficiency

Objective

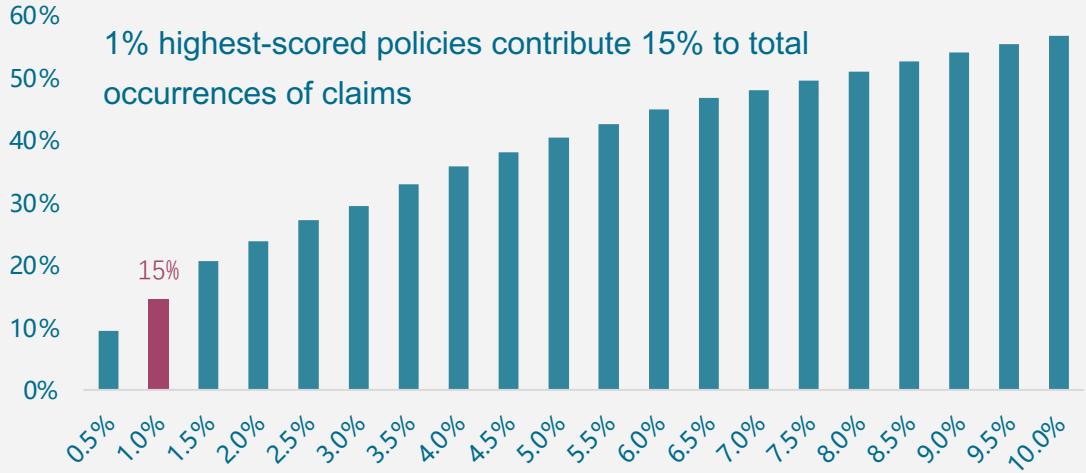
- ✓ Competitive pricing (e.g. selling to the top 80% better risks) and streamlined customer journey (e.g. for better-risk applicants) can be achieved when adopting the predictive engine

Model Performance Evaluation

- ✓ Combined random and time validation to evaluate significant difference in the occurrence of the policies in the different risk groups

Evaluation Results

- ✓ 1% highest-scored policies contribute 15% to total occurrences of claims
- ✓ 50% highest-scored policies contribute almost all occurrences of claims, the other 50% almost contribute none
- ✓ SCOR came in with competitive risk rates and UW requirements supported by the engine being able to identify “good risk” customers



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UW Risk Engine Case 1 – Reinsurance Quotation Simulation for Whole Life Insurance Coverage Increase

Background description: The company plans to launch a *whole life* insurance **coverage increase product** targeting existing customers in the next half year. This product will maintain consistency with the company's current flagship life insurance product in terms of coverage responsibilities and the underwriting standards & claim processing standards.

Please provide separate reinsurance quotations based on the following two scenarios:

Scenario 1:

Customers with prior claim history in our company are excluded from the coverage increase.

Scenario 2:

Customers with prior claim history in our company are excluded from the coverage increase.

+

-> AI-driven risk stratification engine is implemented to assess and segment existing customers.

-> Coverage increase eligibility is open only to the lowest-risk 80% of existing customers.

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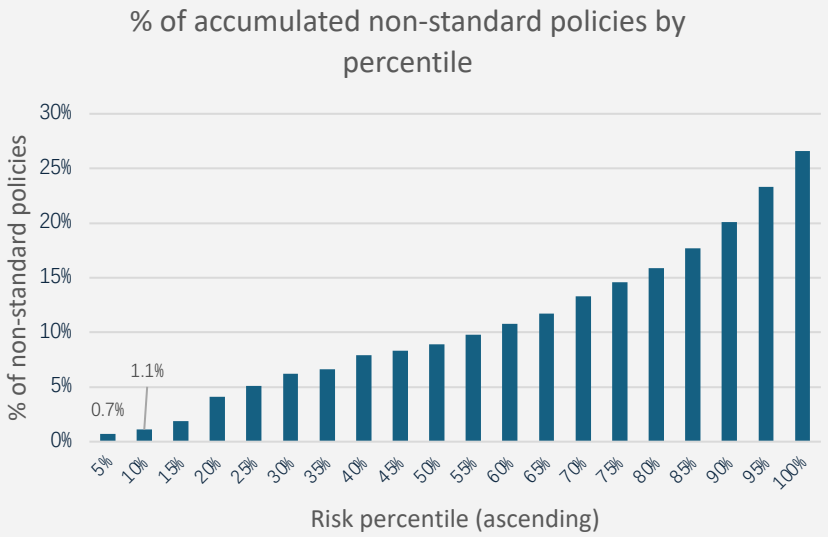
UW Risk Engine Case 2 - Exempting Manual Reviews to Enhance STP

Background & Objective

- ✓ With the application of big data and the accumulation of customer underwriting history, the proportion of cases with claims records or pre-existing conditions is increasing.
- ✓ Over 70% of manually underwritten cases industry-wide result in standard underwriting decisions.
- ✓ In some companies, over 90% of manually underwritten cases are concluded as standard.
- ✓ **Goal:** Improve STP to allow underwriters to focus on a smaller number of truly high-risk cases.

Evaluation Results

- ✓ Among the 5% of cases predicted as lowest risk, only 0.7% are non-standard.
- ✓ Among the 10% of cases predicted as lowest risk, 99% are standard.
- ✓ Manual underwriting can be waived for selected clients based on model results, with controlled risk.



Exemption Rate from Manual Underwriting	% of standard
5%	99.3%
10%	98.9%
15%	98.1%
20%	95.9%
25%	94.9%
30%	93.8%

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UW Risk Engine Case 3 - Exempting Medical Check to Enhance STP

Objective

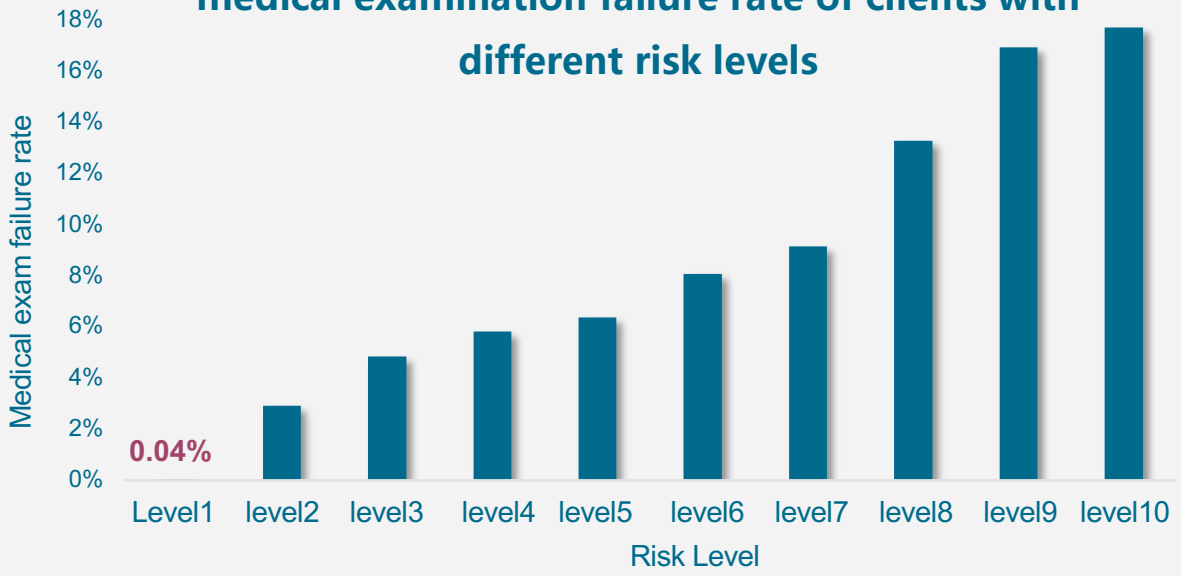
- ✓ identifies clients with low risk, exempting them from medical exams, enhancing customer experience, and reducing examination costs for the company.

Model Performance Evaluation

- ✓ a 3-month trial was conducted. All customers who were originally required to undergo a medical examination still went through the process. The risk model's scores were recorded, observing the relationship between model scores and the rate of failed medical examinations.

Validation results

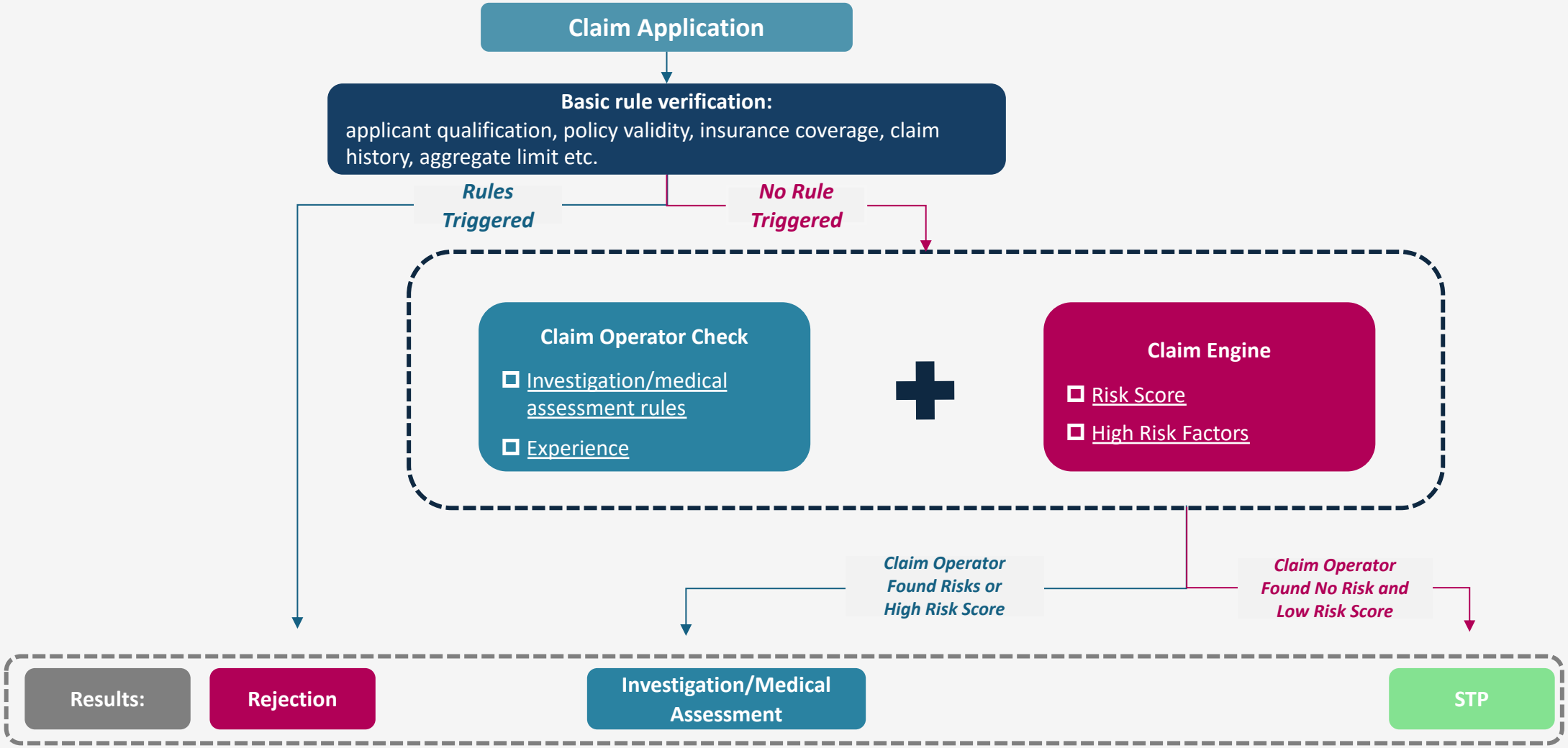
- ✓ For clients in the best-risk category (level 1), only 0.04% didn't pass medical exams
- ✓ RMB 14 million of annual medical examination fee can be saved and risk is controled at an acceptable level



03

Claim Risk Predictive Engine

Predictive AI Engine empowers the claim fraud detection



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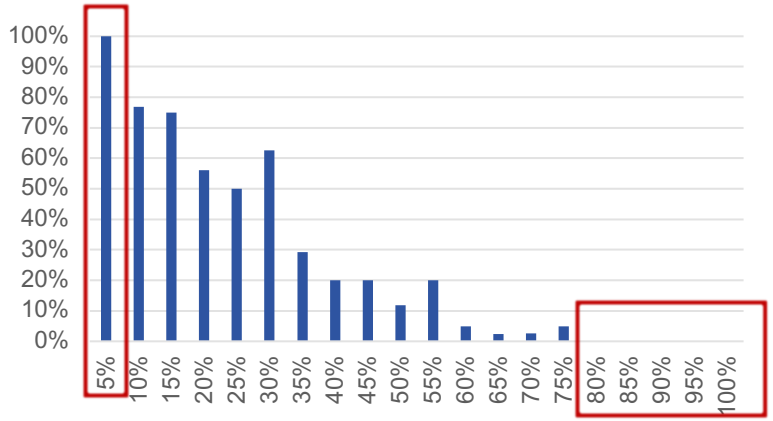
Case Study 1: AI engines enhance the detection of claim frauds

1. Overall predictive model performance

Predictive claim risk model can optimize the claim case investigation：the higher the probability of rejection, the higher the actual rejection ratio

- ❑ Top 5% projected probability of rejection cases, the actual rejection ratio is 100% (Fig 1)
- ❑ Bottom 20% projected probability of rejection cases, the actual rejection ratio is 0% (Fig 1)
- ❑ According to the model projection, the company only needs to investigate 45% claim cases in order to capture 90% rejection cases (Fig 2)

Fig 1: Actual claim ratio by model decile



2. Real cases:

- Case 1: Prediction matches investigation results → the model can capture problematic cases

  Problematic case: A medical policy issued on 2023-06-16, claimed on 2023-07-29. After investigation, claim was rejected

  Model result: the risk score is among the top **1%**, the model suggested human investigation

- Case 2: Prediction matches investigation results → the model can save investigation resource

  Problematic case: A medical policy issued on 2023-10-16, claimed on 2024-03-22. After investigation, claim was paid as normal

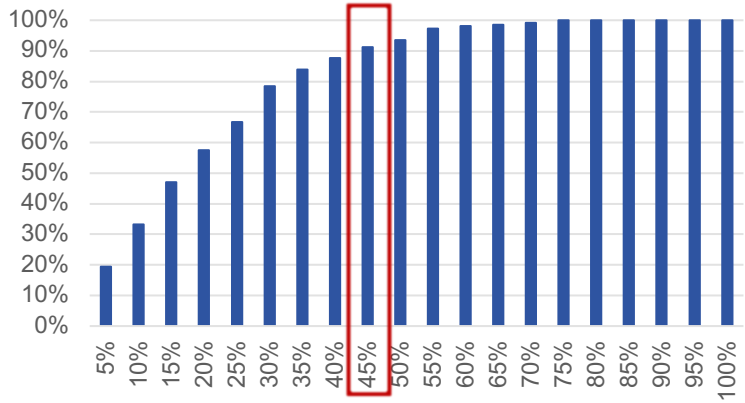
  Model result: the risk score is **79%,** a low risk case, can save investigation resources

- Case 3: Prediction model can capture missed cases → the model can save claim cost

  Problematic case: A medical policy issued on 2022-10-17, claimed on 2023-08-04. claim was paid as normal without investigation

  Model result: the risk score is among the top **1.5%**, the model suggested human investigation

Fig 2: Accumulated claim cases by model decile



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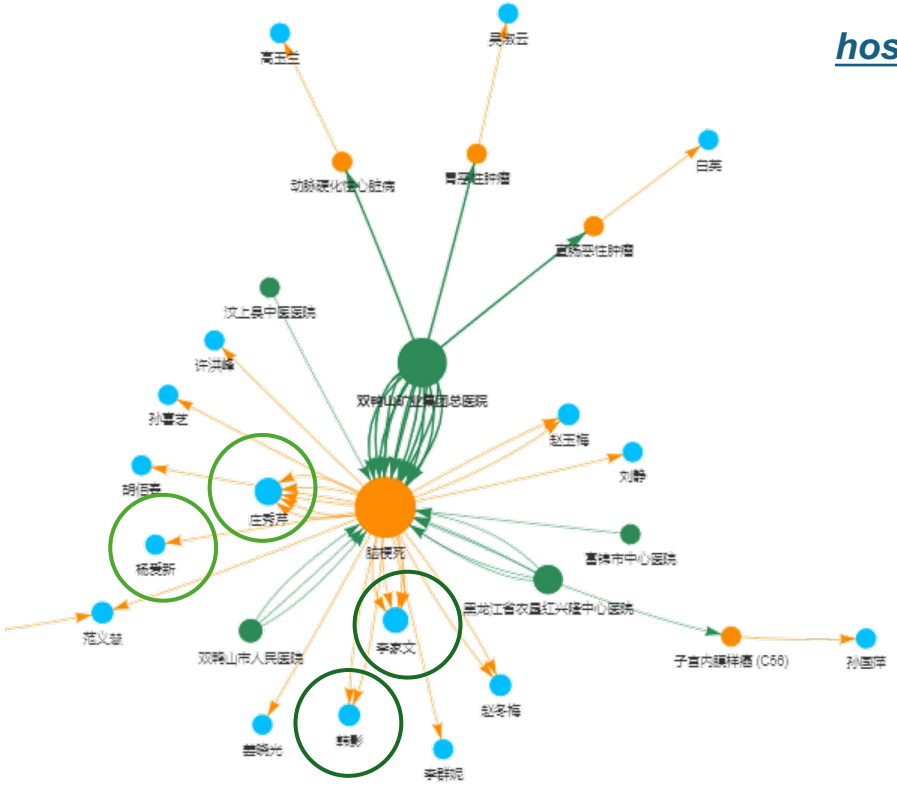
Case Study 2: AI engines enhance the detection of claim frauds

Correlation Graph: Agent – Hospital - Illness



The correlation graph can be used to mine the agent groups with abnormal claim policies, such as: the insurance policies under the names of these agents are concentrated in certain claim causes (and significantly deviate from the normal incidence), and the hospitals and departments that issue diagnoses are concentrated

Real case: In 黑龙江双鸭山**agency office**, insured persons under 5 agents claimed 13 cases due to stroke at the 双鸭山矿业集团hospital within half a year:

- ✓ 2020-05-27, claim case under Agent A
- ✓ 2020-06-30, claim case under Agent B
- ✓ 2020-07-22, another claim case under Agent A
- ✓ 2020-08-01, claim case under Agent C
- ✓ ……

Based on our model, it could identify this high risk agent group upon the 3rd claim case:

- ✓ These 5 agents share multiple insured customers
- ✓ 3 similar cases within 2 months, abnormally high incidence

Follow up actions:

- ✓ The relevant hospital, agents and insured customers are flagged as high risk
- ✓ Subsequent claim cases involving the above are subject to strict review
- ✓ All insurance policies under these agents and customers are subject to risk screening

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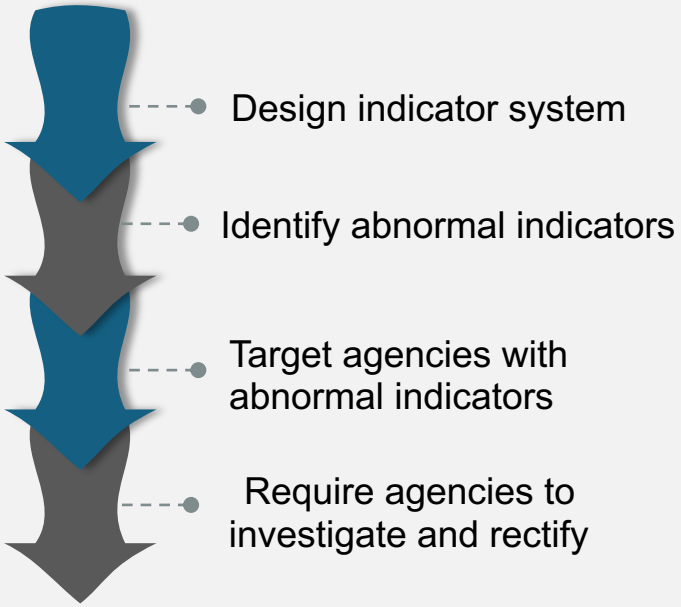
04

Agent Risk Predictive Engine

Current Methods and Limitations of Agent Channel Management

Traditional experience-based analysis methods struggle to effectively and promptly capture agent risks.

Traditional agent management approach top-down



Lag in indicator management

Traditional analysis are delayed in assessing business, teams, and agencies, making it difficult to pinpoint specific agents.

Outdated monitoring methods

Agents' fraud methods evolve quickly, making traditional monitoring methods hard to adjust in time.

Single evaluation standard

The behavior of poor-performing agents varies, making it difficult to use a single standard for effective management.

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Main Potential Risks of The Agent Channel

Policy Surrender Risk

Driven by arbitrage, policies are sold and then are massively surrendered in the future.

- A loss for the individual customer.
- Directly impacts on the profitability and solvency of the insurers, posing potential risks to the company's operations.

Claim risk

Tends to sell policies to high-risk individuals to obtain claim payouts

- Insurers need to conduct numerous claim investigations, leading to low efficiency, high costs, long processing times and bad customer experience.
- Increased unreasonable claim payouts.

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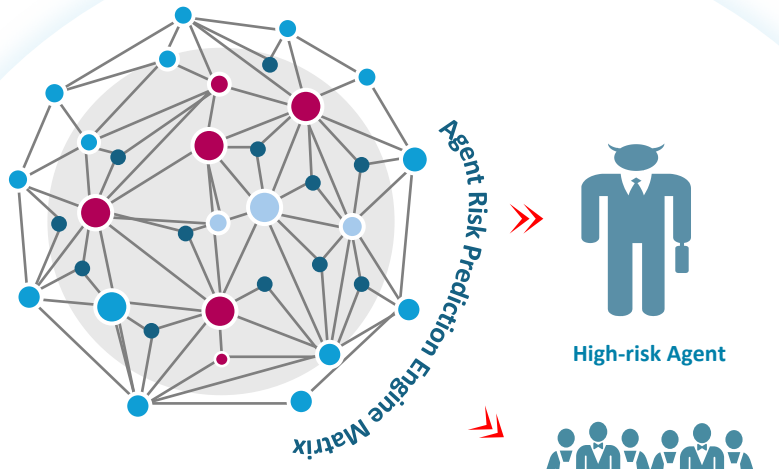
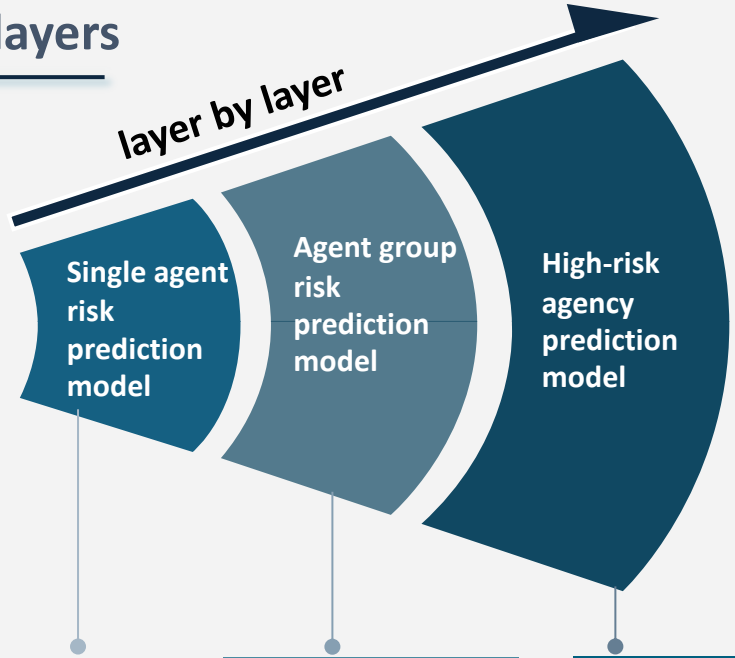
Data and AI-Supported Agent Risk Prediction Engine Matrix



Three layers



Machine Learning

Dynamically assess the agent's risk probability according to each behavior change

Association Map

Discover other agents who are closely related to high-risk agents & identify possible fraudulent groups

Statistical Analysis

Identify branches with prominent agent problems by analyzing the distribution of high-risk agents and agent groups by branch

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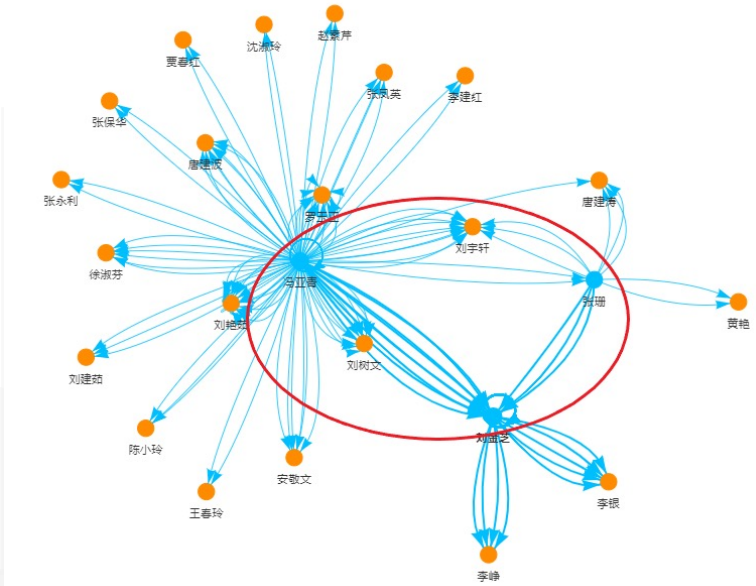
Using Association Graph to Uncover Potential Fraudulent Groups

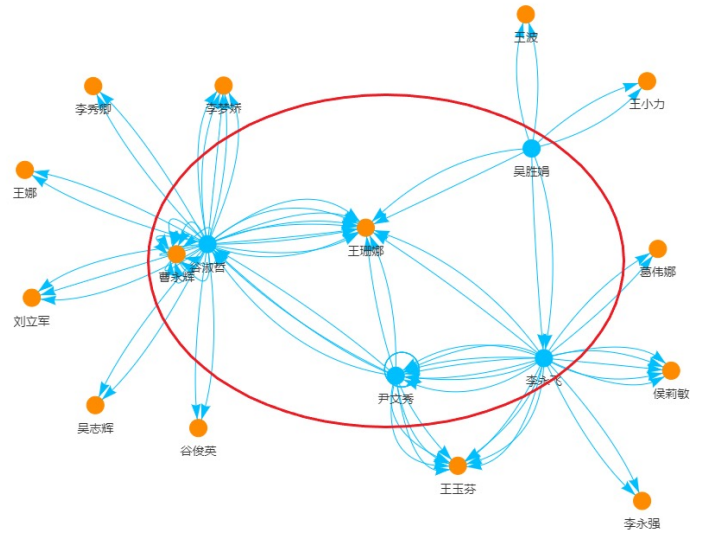
Actual investigation verifies the group fraud risks identified by association graph

Engine Identified High-risk Groups

1 mutual insurance and shared insured individuals among 3 agents



2 mutual insurance and shared policyholders among 4 agents



Investigation Results

- Agents are engaging in mutual insurance to help others meet KPIs
- Agents split a customer's policy between two agents to meet KPIs

- Most of the policies have terminated, with only 2 annuity policies remaining active.
- The team is involved in fraudulent activities to meet KPIs & commission reward.

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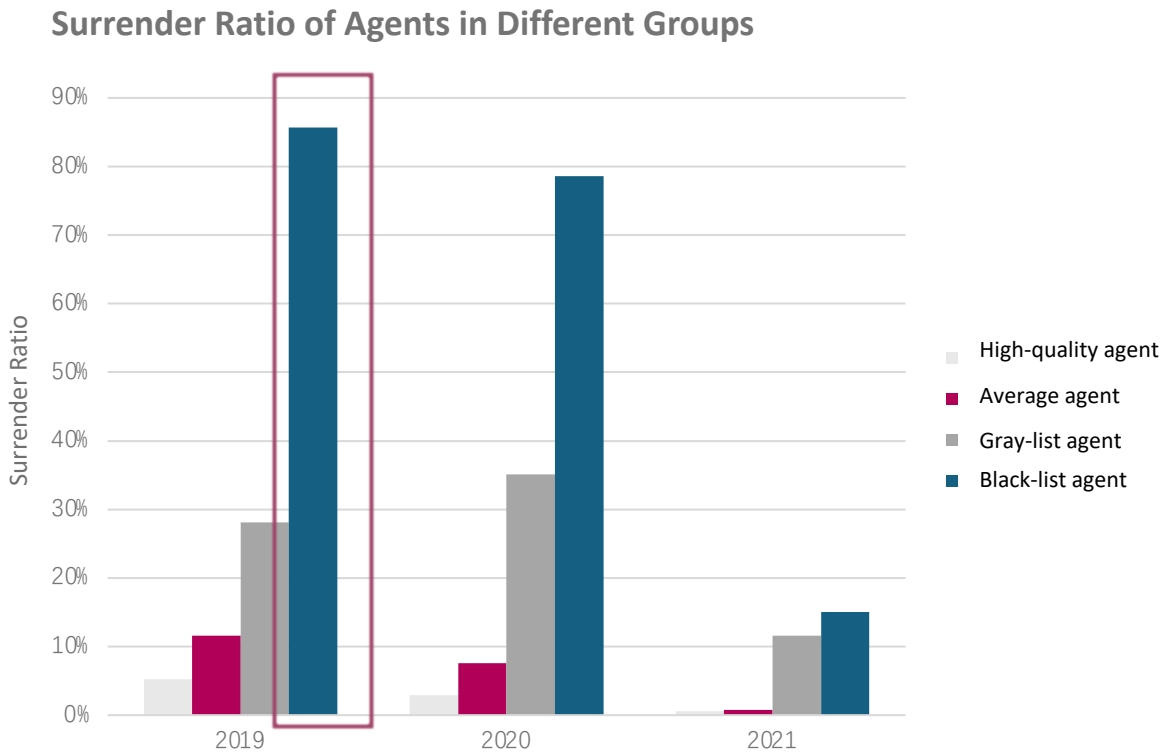
Agent Surrender Risk Prediction Engine Performance

❑ Objective

Predict agents' risk of arbitrage and categorize them into 4 groups

❑ Model Performance

Agents classified in the blacklist group have a policy surrender rate of up to **80%** within the first two years.



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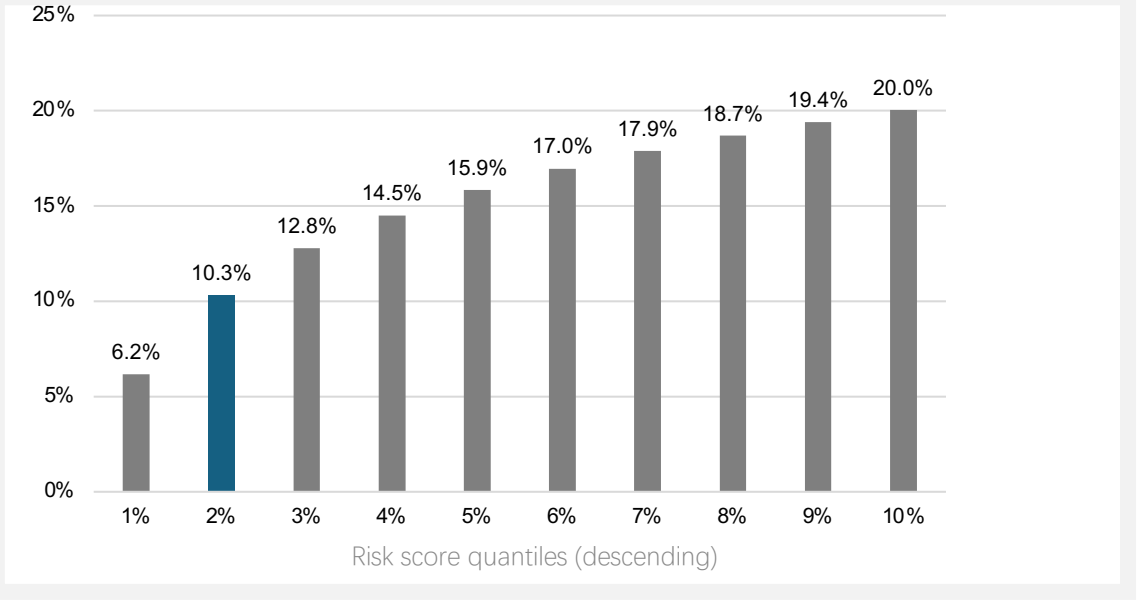
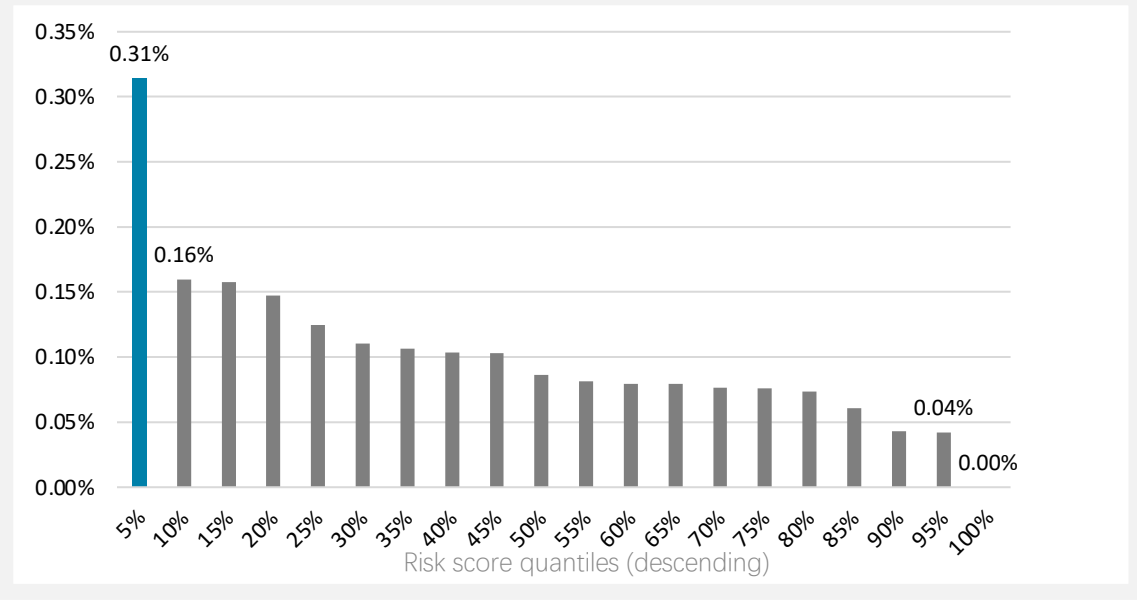
Agent Claim Risk Prediction Engine Performance

% of claims savings under different thresholds



- ✓ Controlling the top **2%** of agents will reduce the total claims payout by **10.3%**
- ✓ Assuming fraud claims account for **20%** of the company's overall payment, by controlling these **2%** of agents, fraud-related claims can be reduced by about **50%**

Actual claim rate of agents after 2020



- ✓ **5%** of agents with highest risk has actual claim rate of **0.31%** after 2020
- ✓ For comparison, the actual claim rate of policies sold by all agents after 2020 is **0.1%**

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Potential Agent Management Measures Based on The Engine Outputs

Individual Agent Risk Management

New Policy Application / Daily Run

Indicators

High Risk Agent

Low Risk Agent

Agent Risk Predictive Engine

High Risk Agent

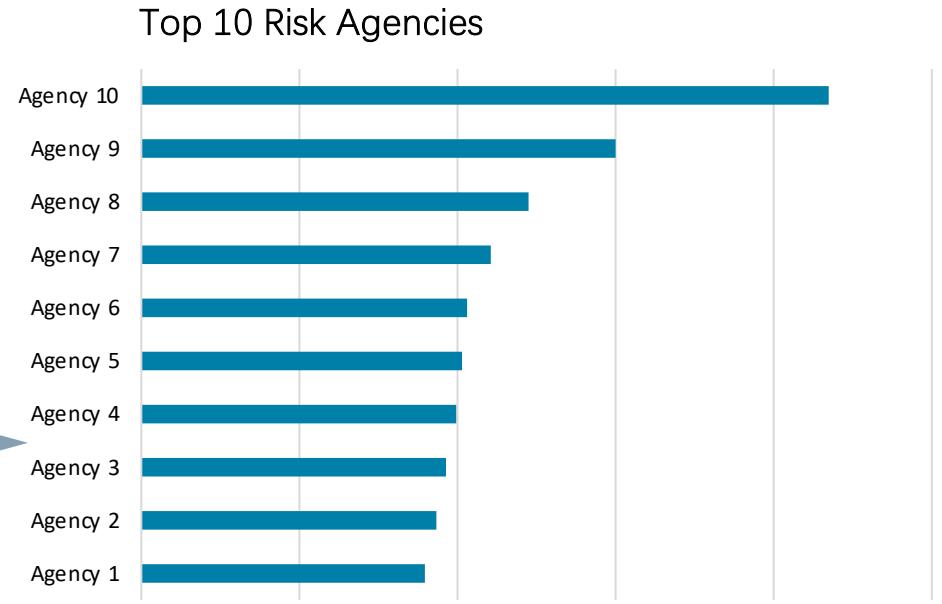
Low Risk Agent

- Prohibit the sale of high-commission / high-risk policies (e.g. high leverage/high coverage)
- Commissions are deferred, with the payout ratio tied to the level of surrender risk / the timing of claims
- Stricter UW rules

- Higher commission
- High NML

results

Agency Risk Management



Aggregate and rank the individual risk results by agency. For agencies with abnormal risks, investigate them and take measures accordingly.

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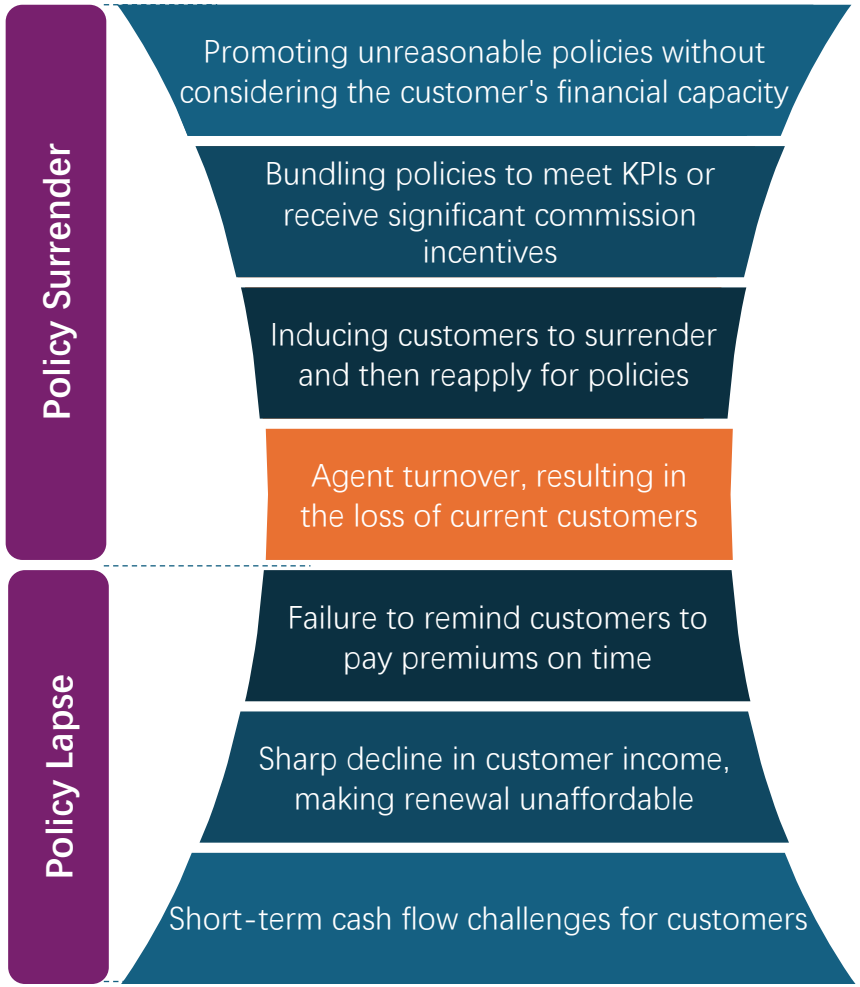
05

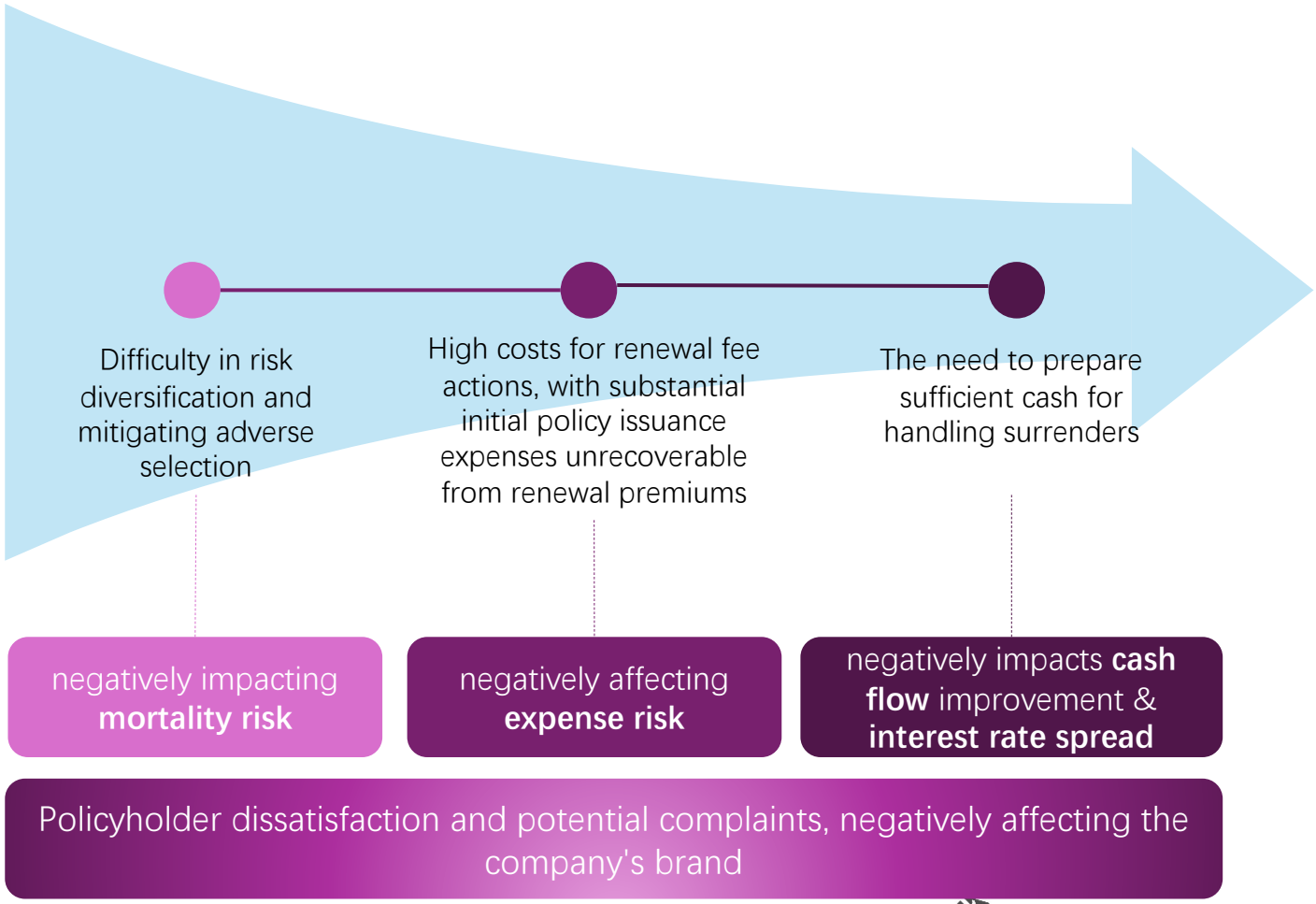
Persistency Risk Predictive Engine

Main Potential Risks to Policy Persistency

Main Scenarios Leading to Low Persistency Rate



Consequences



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Current Methods and Limitations of Persistency Management

Traditional methods lack accurate, data-supported insights and refined management measures.

Traditional Persistency Management Approach

Front-End Quality Mgmt
- Promote need-based product sales
- Evaluate agents by persistency rate
- Reward agents with renewal bonuses
- Restrict policy transfers within 1-3 years post-agent termination

Mid-Process Control
- Online and offline payment reminders
- Promptly respond to customer policy service needs
- Monitor persistency indicators
- Address policy termination reasons with support options

Back-End Supervision & Inspection
- Strictly control personal favor policies and self-insurance cases
- Supervise and train agents to boost sales skills, improve performance, and reduce turnover

Limited renewal service methods

Increasing product varieties while providing uniform services results in poor customer experiences

Low utilization of customer & service data

Data is recorded without effective analysis of customer needs

Crude persistency indicator monitoring

Lacking refined management matrices considering different dimensions of region, product, sales channel etc.

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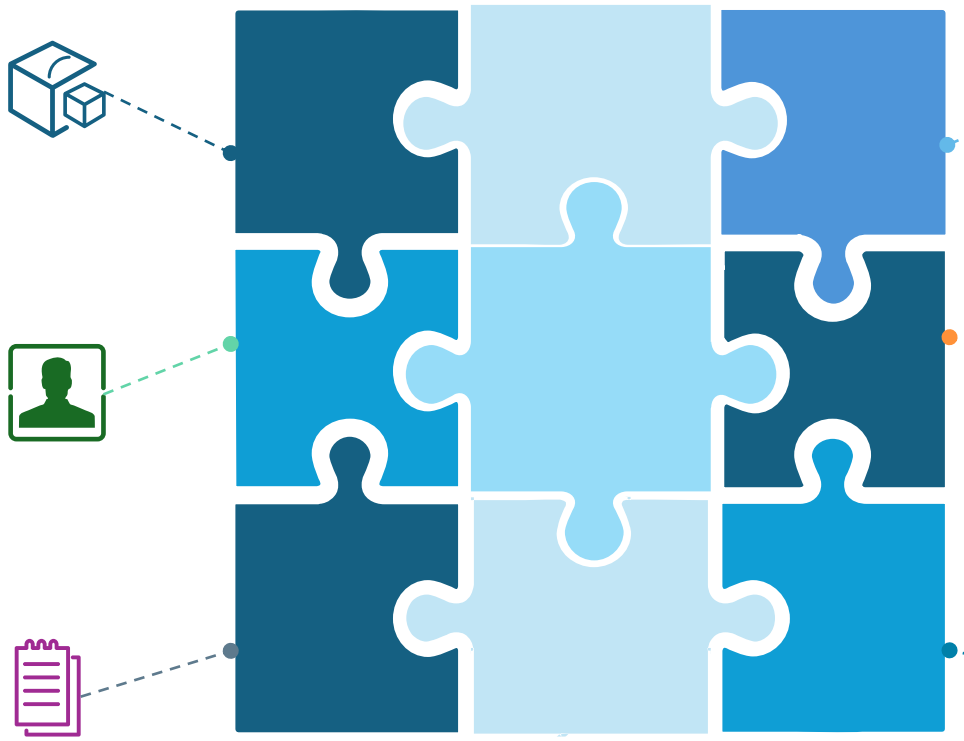
Significant Persistency Risk Factors



Product Related

Product Types

Policy Year

★ Face Amount

Premium Payment Mode

Insured Related

Gender

Age

★ Smoking Status

Income Level

Underwriting Related

★ Risk Class

Underwriting Methods

Agent Related

Commission reward

KPI pressure

Turnover

After-sales related

Customer engagement

Service quality

Macro-economic Related

Economic Swings

……

Persistency is a key driver of profitability in L&H insurance business and driven by various factors and their interactions.

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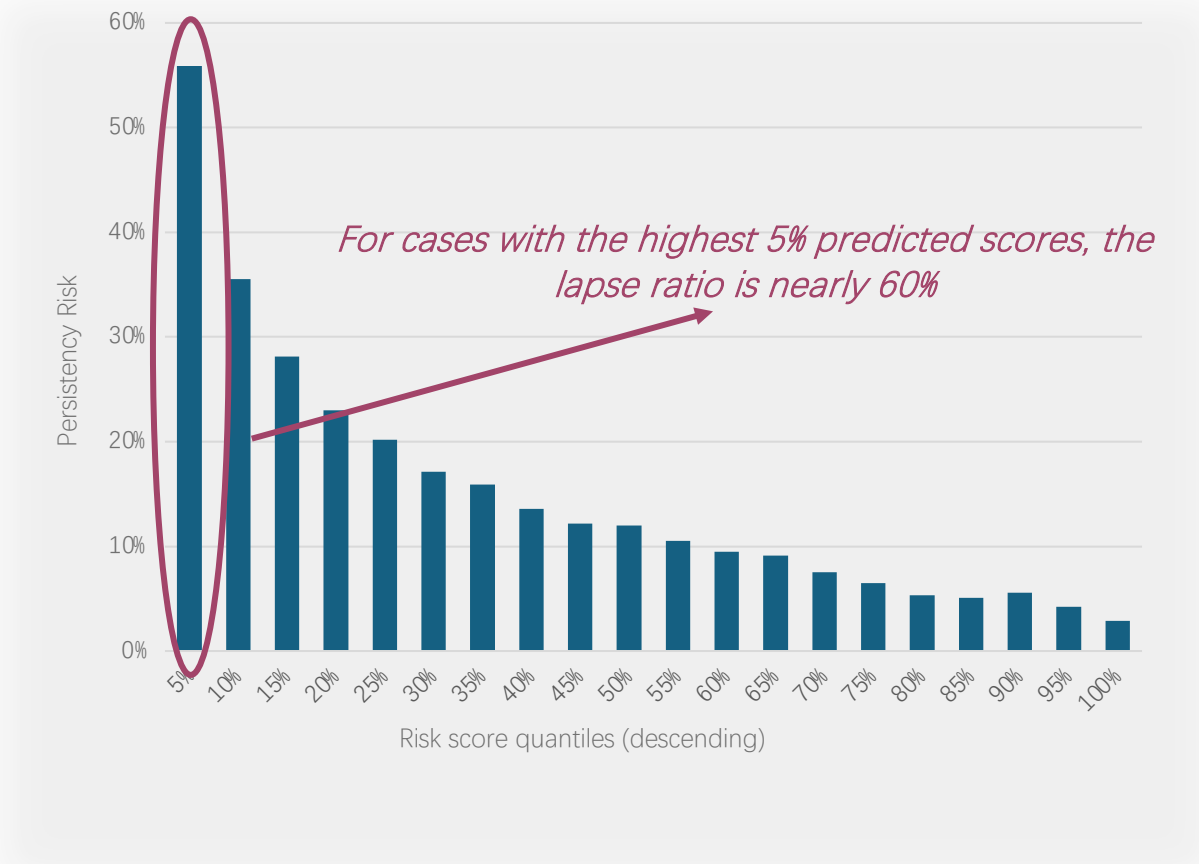
Persistency Risk Prediction Engine Performance – Case 1

Objective

- ✓ The insurer is in a passive position when dealing with policy terminations.
- ✓ By utilizing a persistency risk prediction model, we can match differentiated product sales and resource allocation strategies based on the customer's risk.

Engine Performance

- ✓ For the top 5% of high-risk policies identified by the model, the actual two-year termination rate is 55.9% (3.7 times the average rate).
- ✓ For the top 10% of high-risk policies identified by the model, the actual two-year termination rate is 35.5% (2.4 times the average rate).



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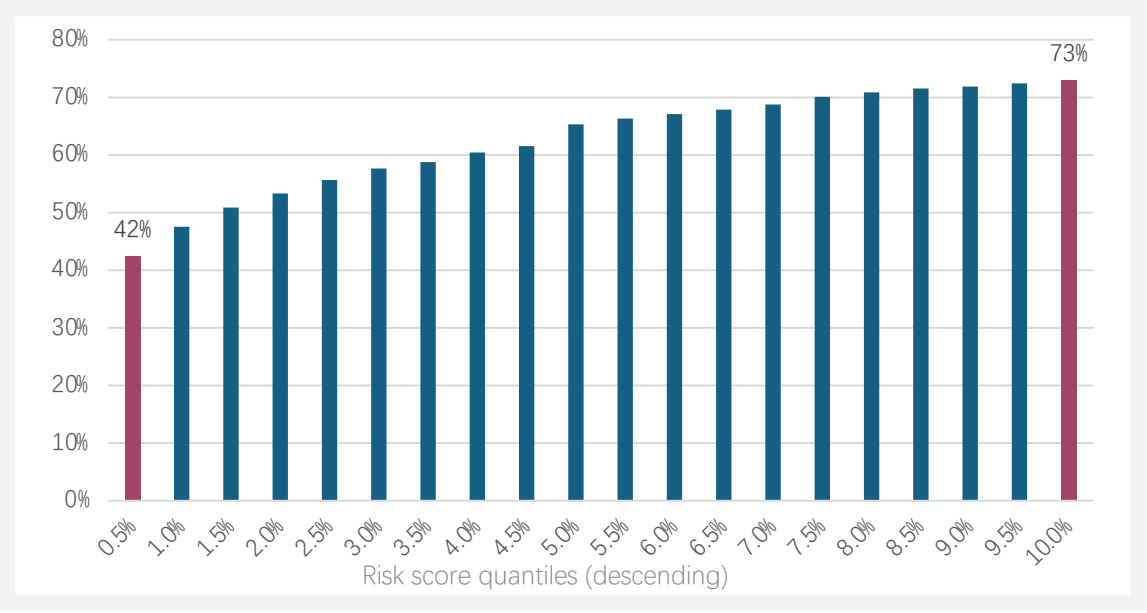
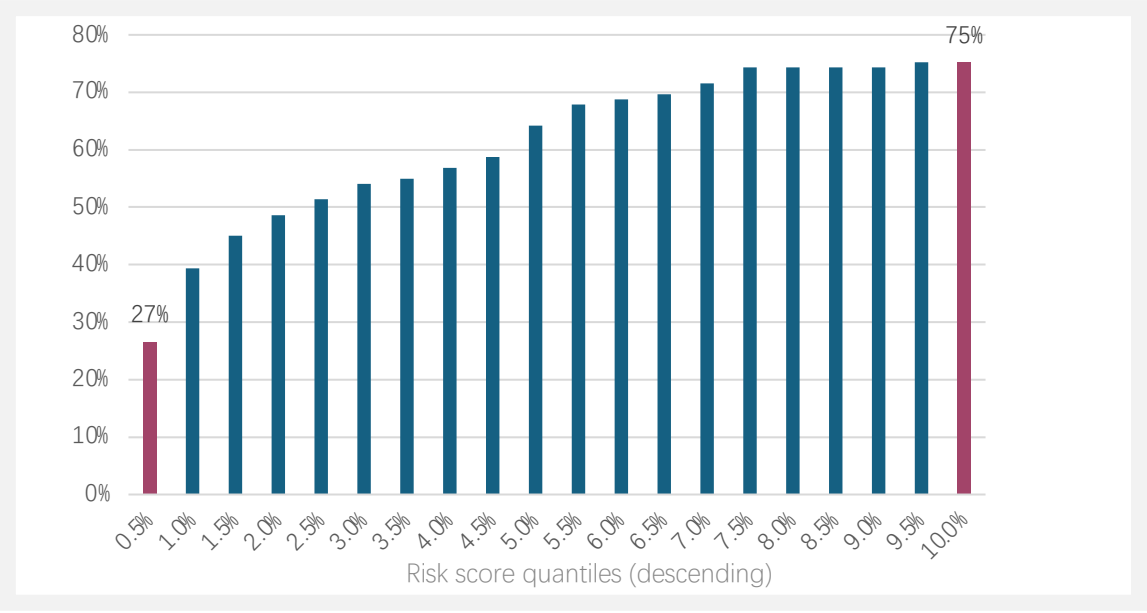
Persistency Risk Prediction Engine Performance – Case 2

Accumulated % of commission involved in surrender policies



- ✓ Controlling the top **0.5%** of agents will save **42%** of the commissions involved in the surrender policy
- ✓ Controlling the top **10%** of agents will save **73%** of the commissions involved in the surrender policy

Accumulated % of agents with high surrender risk



- ✓ **Definition** of high-risk agents: 5+ policies issued & surrender commissions >10k RMB & policy surrender rate > 25%
- ✓ Among the top **0.5%** of agents, **27%** of high-risk agents are identified
- ✓ Among the top **10%** of agents, **75%** of high-risk agents are identified

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Potential Persistency Intervention Measures Based on The Engine Outputs

Proactive Risk Management

For Agent/Agency/Channel Mgmt

Predict overall persistency risk within the customer group

Identify agents' risk scenarios

Implement corresponding operational measures

- Tighten the NML
- Defer commission payments

Product Recommendation at Point of Sales

When Cross/up Selling Products

Predict the customer's persistency risk for different products

Identify customers' preference

Design differentiated sales strategies

- Recommend products with low future surrender risk
- Recommend surrender-supported products
- Check customers' financial status to verify payment ability
- Limit agent commission payments to reduce misuse opportunities

Continuous Monitoring Active policies

When Policy in Force

Continuously monitor existing customers' risk

Track customer surrender/lapse trends

Intervene early with high-risk customers

- Promptly contact to understand reasons
- Provide targeted measures to retain customers

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06

Purchase Propensity Predictive Engine

Current Methods and Limitations of Sales

Agent/Broker Sales

Time-Consuming
Difficult to Match Customer Needs

Online Platforms

Lack of Personalization
Overload of Information

Telemarketing

High Drop-off Rate
Limited Data Utilization

Bancassurance

Limited Personalization
Low Engagement

Bad Customer Experience
Low Conversion Rate

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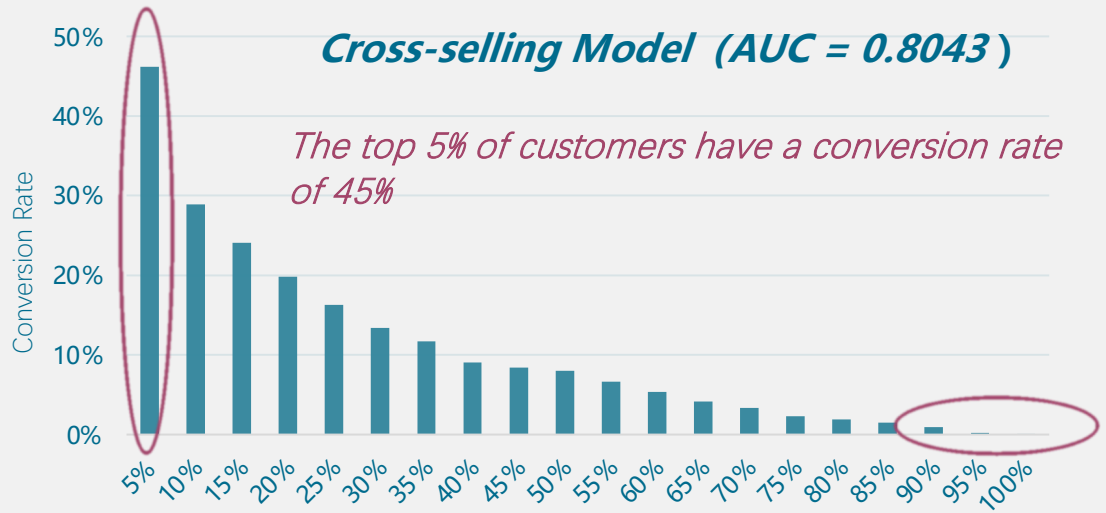
Purchase Propensity Engine Performance

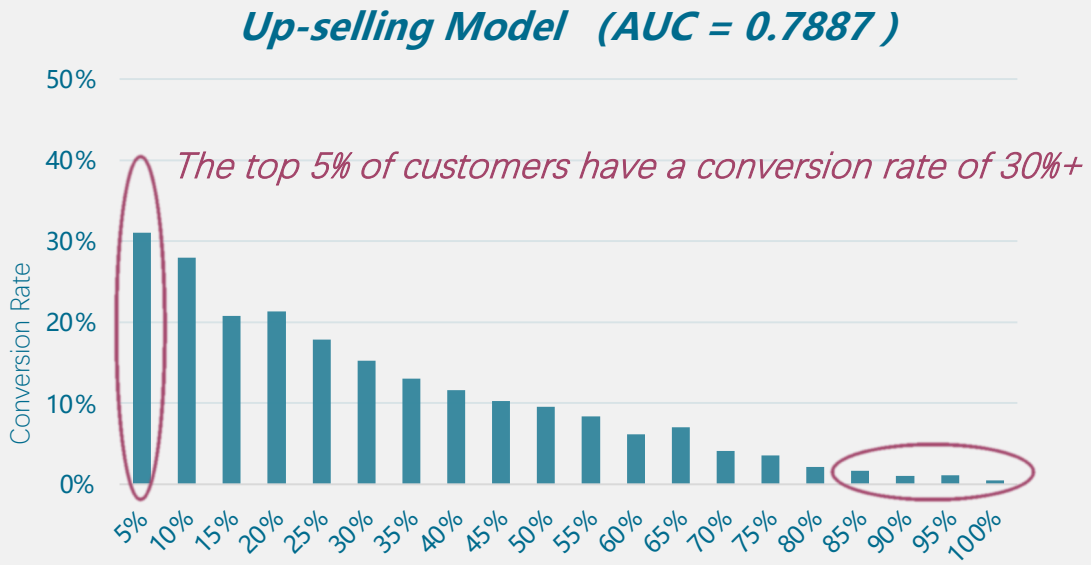
Objective

- ✓ By establishing models for new customer and existing customers, agents can effectively identify key customers to target and the most suitable products to recommend.
- ✓ This approach allows agents to sell more precisely, optimizing the customer experience and improving the ROI.

Model Performance Evaluation

- ✓ The top 5% of new customers, as predicted by the cross-selling model, have a conversion rate of 45%
- ✓ the top 5% of existing customers, as predicted by the up-selling model, have a conversion rate of 30%+





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Purchase Propensity Engine Application

- Incorporate a purchase prediction model into the agent sales tool, displaying the probability of new and existing customers purchasing or upgrading policies in life insurance, critical illness, accident, medical, and annuity insurance.
- Guide agents on whom to recommend products to and which products to recommend, thereby empowering precise sales.
- Enhance the success rate of sales efforts and ensures the accurate allocation of sales resources.

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