Investigating applications of data science in actuarial teams

A BENCHMARKING OF ACTUARIAL DEPARTMENTS' PRACTICES & PROPOSED RECOMMENDATIONS BASED ON INDUSTRY RESEARCH

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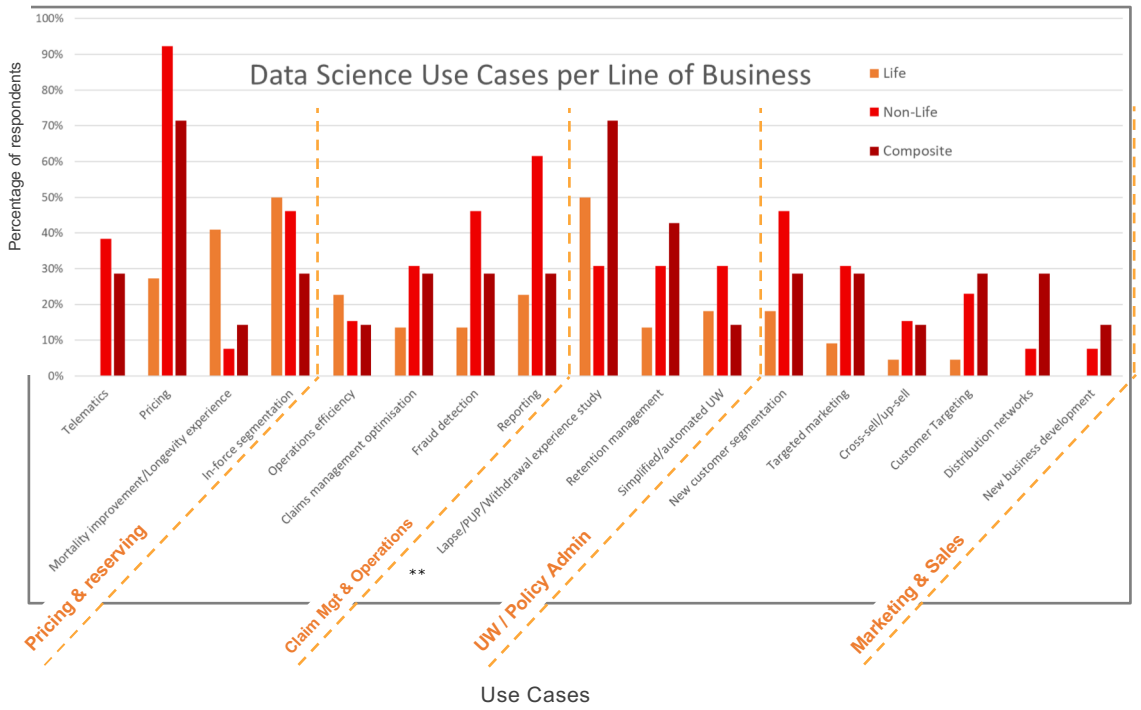
HOW DO INSURERS CREATE VALUE USING DATA SCIENCE?



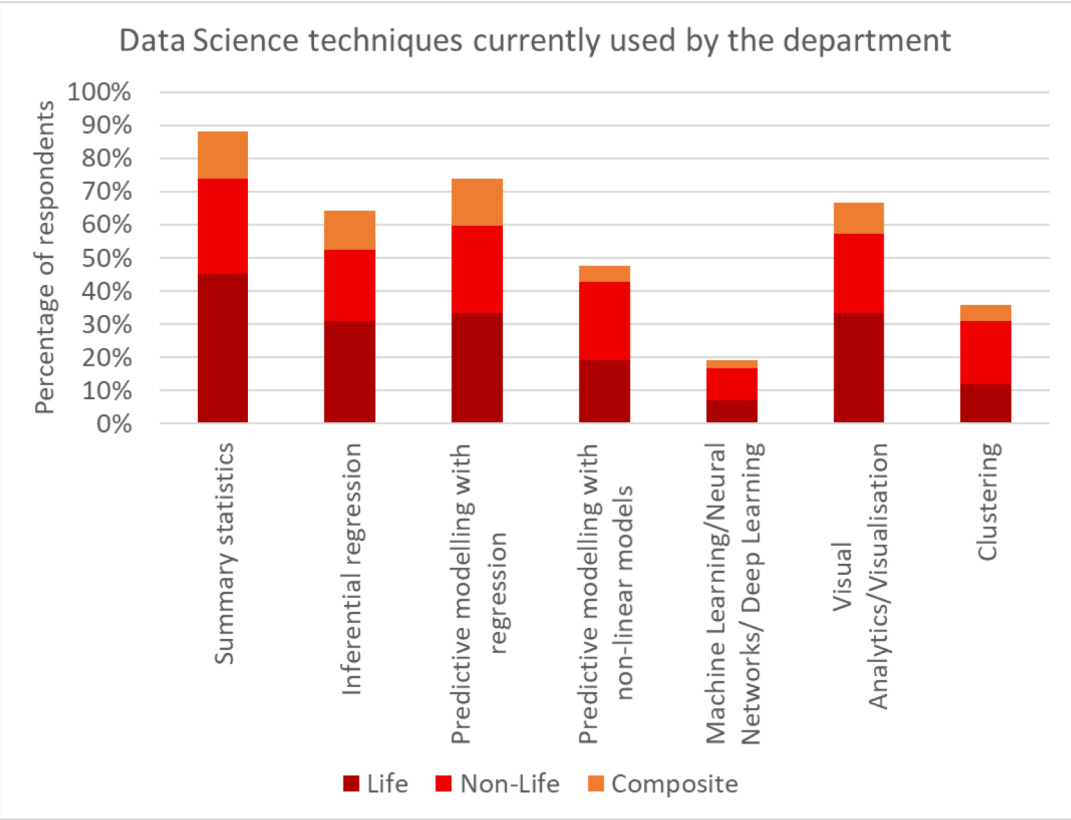
** This could be as a result of the nature of our respondents' profiles (our respondents were mainly from actuarial departments and hence may not be fully representative of the true situation at each individual company).*
*** Lapse experience study are also applicable to pricing & reserving projects*

Benchmarking Diagram 4

Key take-aways

- What are the most deployed data science use cases in insurance?
  - Data science use cases include those related to insurance core functions (experience analysis, pricing, underwriting, reserving)
  - Data science use cases are not yet so widespread in upstream (marketing, sales) and downstream (claim management) activities*
- The extent to which Data Science is applied in these use cases depends on the nature of the department and specific challenges faced; as well as the specific techniques and skills applied
- Interactions with the wider business is essential to the success of use cases. Actuaries and data scientists collaboration is essential in optimal application

DATA SCIENCE TECHNIQUES APPLIED



Benchmarking Diagram 13

Key take-aways

Overall observations

- Exploration with advanced techniques like machine learning/neural networks/deep learning are still only done by a small number of respondents

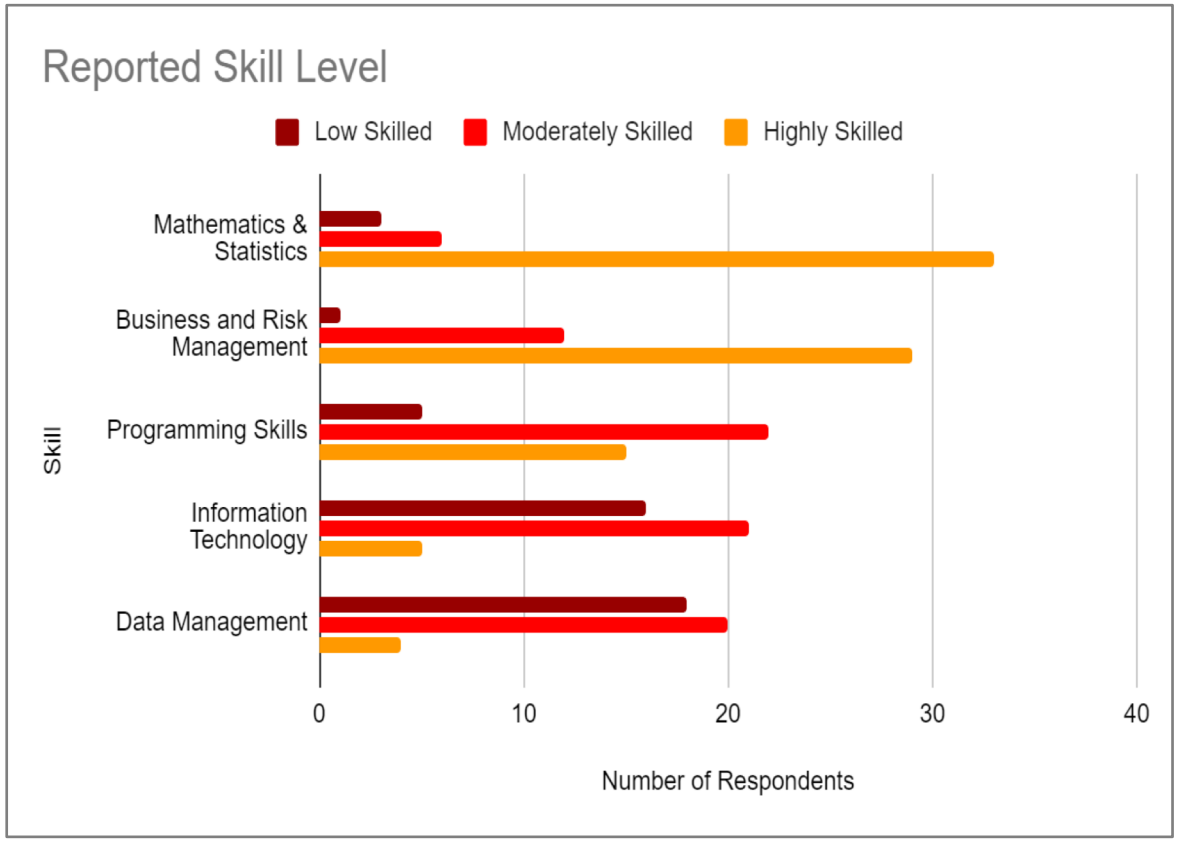
Most common techniques

- Mostly still conventional techniques such as
  - Classical summary statistics
  - Inferential regression
  - Predictive modelling with regression
  - Visualisation Techniques

Crucial criteria for applying new techniques

- Enough data and data quality
- Predictability vs interpretability of model
- Costs vs. effort and frequency of use
- Significant improvement expected; compared to models currently used
- The objective of the data science exercise

PEOPLE AND PROCESSING: SKILL LEVELS



Benchmarking Diagram 14

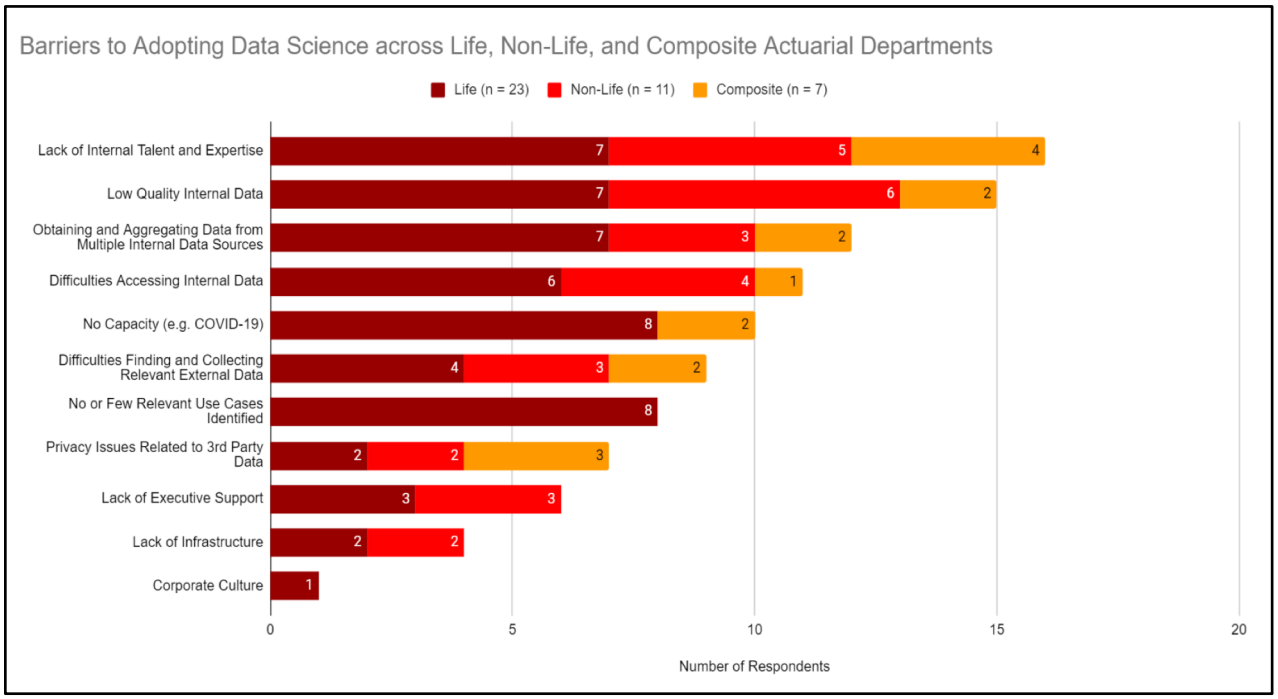
Key take-aways

In respect of actuarial departments; respondents reported:

- As expected, high skill levels in respect of mathematics & statistics and business & risk management knowledge;
- Relatively lower skill levels in respect of data management and IT;
- Medium level of skills in respect of programming
- The business and risk management skills category included skills related to communication, risk management, validation and reporting

BARRIERS OF DATA SCIENCE APPLICATION

LIFE VS NON-LIFE VS COMPOSITE COMPANIES



Key take-aways

- **Lack of internal talent** and **low-quality internal data** are the biggest barriers for life, non-life, and composite insurer's actuarial departments
- **For Life** departments the biggest challenge appear to be **the lack of relevant use cases** identified and lack of **capacity** to perform data science related activities.
- **Non-Life** departments appear to have greater difficulties **accessing and using data resourcefully**.
- **Composite** departments report **privacy issues related to 3rd party data** as a barrier.

Benchmarking Diagram 16

Data Science Considerations	Data Science Maturity Level (Benchmarking Actuarial Departments)			Levels Key
	Low (I)	Medium (II)	High (III)	
Vision & Strategy for Implementation				**I**: No formal strategy reported, or in early stages. **II**: Structured plan in place. Needs further refinement **III**: Specific vision & plan with internal governance for A.I. and Big Data
Extent of Application beyond traditional actuarial workflow				**I**: Limited data science application (data science activities related to data management & reporting processes) **II**: Assumption setting and pricing strategies including Proof of Concept. **III**: Key business decisions, fraud detection, consumer behaviour, value-added initiatives
Non-Traditional Data Sources Used				**I**: Traditional such as policyholder, financial/credit. Limited external data **II**: Mix of internal and external sources. Internal data reflects their experience, risks, and the market they operate in **III**: Also includes text mining, customer behaviour, telematics data
Data and Software Policies in Place				**I**: No formal policies beyond Organisational **II**: Approved software & package. Department-specific data policies around using & access. **III**: Specifying department's IT governance. Focus on validation protocol in addition to data governance - particularly when using advanced models
Data Science Techniques Applied				**I**: Only summary statistics and simple visualisation applied **II**: Fitting GLMs and advanced visualisations (dashboarding) **III**: ML predictive models, automated processes, incorporating AI
Integration with other Domain Experts				**I**: No integration **II**: Integration where appropriate **III**: Specific roles designated (IT; data management; integration)
Infrastructure Control (Data, Hardware, Shared Resources)				**I**: Limited control. Aligned to IT standards **II**: Department team leaders coordinate shared resources **III**: Full control; integrated based on department's needs
Tools Used				I: Mainly proprietary software (Excel, Prophet, Emblem, etc.) **II**: Proprietary legacy systems, some open-source (R/Python) **III**: Mainly open-source. Innovate in-house software packages
Training and Upskilling Strategies				**I**: No formal strategy to improve team's skills. Some individuals may choose to upskill in their own capacity **II**: Some training is offered; however it is either not prioritised or too generic for specific actuarial work **III**: Relevant Actuarial data science upskilling is integrated into the department.

Benchmarking Diagram 17

= 5 Respondents