KPMG

Actuarial Process Optimization (APO)

2020 ASNY Annual Meeting

November 23, 2020

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With you today

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Alex is a Director in the KPMG Actuarial advisory practice, based out of the New York office. He has over 15 years of experience with consulting, insurance and reinsurance firms.

His experience includes actuarial modeling and model conversions, actuarial modernization and technology implementation, accounting change projects, internal and external audit support, experience analysis, product and assumption development.

Alex is a frequent speaker at industry meetings and contributor to actuarial publications on topics of actuarial data, modeling and technology.

James Chi

Director, Financial Services

James is a Director in the KPMG Financial Services consulting practice, based out of the San Francisco office. He has experience working with large financial institutions, including insurance and reinsurance firms.

James primarily focuses on providing management and technology consulting services to financial institutions. He has extensive experience leading technology and data transformational initiatives from target operating model design and implementation planning through program execution.

Brandon Lin, ASA

Senior Associate, Risk Consulting

Brandon is a senior associate in the KPMG Actuarial advisory practice, based out of the Chicago office. He has over 4 years of experience working with life and annuity products.

His experience includes actuarial modernization and automation, actuarial modeling, internal and external audit support, and accounting change projects.

Prior to joining KPMG Brandon worked for a pension consultancy, focusing on risk management, investment strategy, valuation, and financial reporting.

Agenda

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Actuaries and technology – A brief history

Actuaries and technology

- Actuaries used to own their own technology and data
  - Some coded in advanced programming languages
  - Others managed relational databases
  - Multiple valuation systems existed in actuarial domains
  - Silos existed throughout actuarial operations
  - Automation was embedded in a single platform (VBA for Excel) – software automation
- With introduction of SOX and focus on governance and controls changes occurred
  - Governance and controls around actuarial processes became key focus area
  - Discussions around process ownership between actuarial and IT teams took place
  - A separation of duties had to take place – the big question remained: who owns what?
  - Many transformation initiatives focused on standardization and streamlining of processes
  - Automation was at its infancy, but was preferred over manual, repetitive processes

Actuaries and technology (continued)

- Working with IT – A Happy Marriage?
  - As IT took over technology-focused tasks from actuaries, multiple support models evolved
    - Centralized, dedicated, hybrid
  - The goal was to separate code and data heavy transformations from actuarial processes
  - Difficulties driven by prioritization of tasks, gaps in business knowledge, misalignment in goals
  - The move to the cloud has begun
- Emergence of low-code/no-code, automation and visualization tech
  - New generation of platforms that did not require deep coding knowledge
  - Drag and drop routines, recorded macros, intuitive interfaces made it easier to automate
  - Visualization software came first with exciting drill-down capabilities and advanced graphics
  - Rule based automation of repetitive simple tasks with structured data sources followed
  - Some companies use interactive automation that can ingest unpredictable data or patterns of information and produce structured or variable outcomes
  - Many actuaries organizations are on the cloud, automation routines take place in the background

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Overview: What is APO and how does it work?

Insurance market trends

Insurance company demands

- Lean operations
- Timely and high-quality production processes
- Controlled automation
- All aspects of production flowing through the main production process
- Validated actuarial models that produce alerts for errors or exceptions
- Effective handling of large amounts of data – historical, transaction and client data
- Innovation and new technology integrated to existing processes to facilitate the above

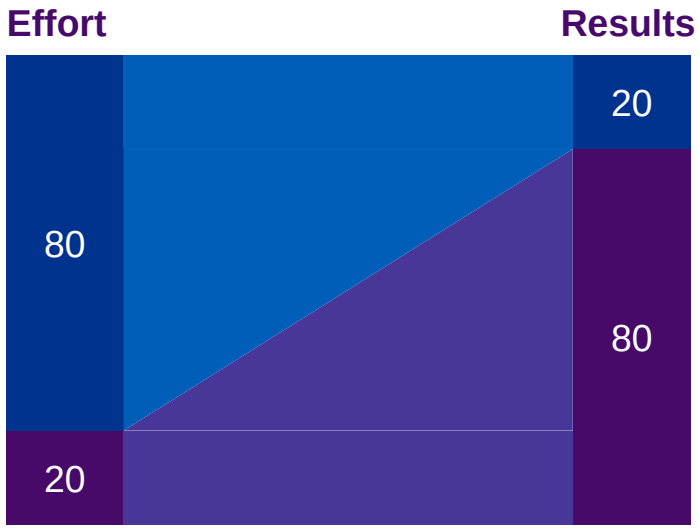
External environment

- Small group of actuarial and finance systems dominate the market
- Significant accounting changes across all reporting bases
- Insurance industry behind on use of evolving robotics and artificial intelligence technologies
- Low interest rates driving insurers to seek new ways to extract margin from aging blocks
- External pressures have driven insurers to seek cheaper labor options overseas

Problem definition: The 80/20 principle

A commonly observed phenomenon in business, economics, and mathematics is that 80% of results come from 20% of efforts. In an environment of changing regulatory, technological, and macroeconomic demands, are your resources being utilized for their full potential?

"80/20 Principle"



Common sources of high effort / low value processes

1. Inability to use/optimize technology required to execute certain tasks
2. Exclusion of unique or complex business segments from the main process
3. Multiple platforms (data, actuarial valuation, reporting) that have similar roles
4. "Band-Aid" solutions that require manual intervention on recurring basis
5. Missing data or assumptions that require manual review, back-filling or estimation
6. Recurring, repetitive processes that cannot/have not been automated
7. Reliance on third party (internal or external) information that may lead to delays

Common outcomes of high effort / low value processes

Unnecessarily complex and error prone ETL, production and reporting workflows

Multiple unvalidated spreadsheets with overlapping functionalities

Time and resources wasted on resolving errors and tracing back complex process steps

Multiple sources of information, but no single “source of truth”

Production and process errors that can result in misstatements and delays in reporting

Storage and processing time wastage

Introduction to actuarial process optimization

What is APO?

APO is a top-down, multistep process of identifying, prioritizing and resolving inefficiencies in actuarial processes using technology enablers.

Under the KPMG APO framework, a cross-functional team evaluates and identifies processes with the highest effort and lowest, value and restructures these using a toolkit of technology solutions.

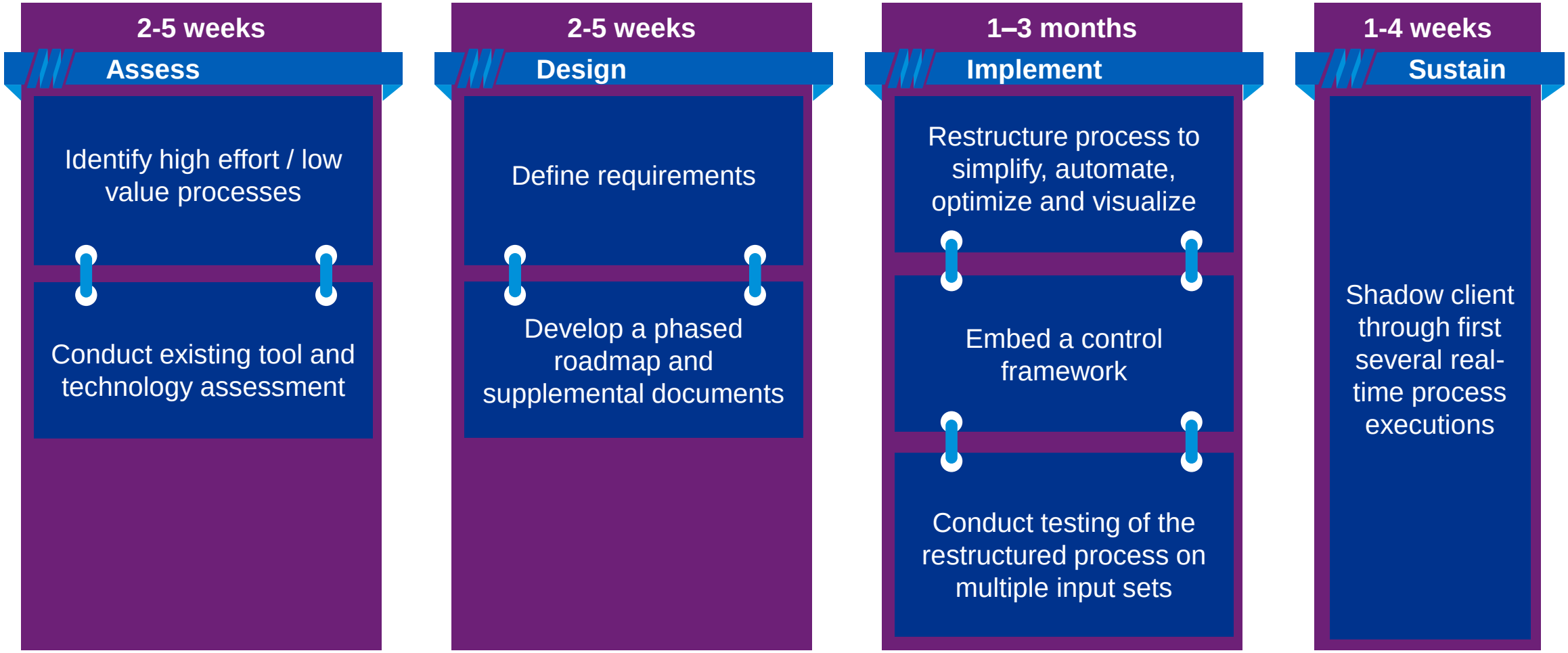
How does APO differ from transformation?

A transformation is traditionally thought of as a multi-year and multi-million dollar effort of complete or partial restructuring of a function within an organization.

APO targets the high effort / low value, resource and time intensive, processes within the overall function and focuses on optimizing these within a short timeframe.

Criteria	APO	Transformation
Timeframe	2 – 6 months	Multi-year
Budget	$75K - $250K	Multi-million
Scope	High effort / low value processes	End-to-end function
Technology Focus	Embedding, configuration, optimization	Implementation
Final product	Optimized process	Restructured function

Stages of the APO framework



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Technology enablers

Actuarial process optimization overview

Focus areas of APO	
Data, automation and optimization	— Controlled automation — Robotics-driven processing — Data optimization solutions
Modeling and actuarial processes	— Model simplification and runtime optimization — Model process automation and controls — Model and platform rationalization
Financial reporting and visualization	— Reporting data consolidation, automation and visualization — Flexible and intuitive reporting of process results — Controls around financial reporting

APO technology enablers

Data, tools, and technology

Controlled automation

- Python
- C ++
- Visual Basic

Robotics-driven processing

- Blue Prism
- IBM Watson
- UiPath
- Appian
- Automation Anywhere

Data optimization solutions

- SQL
- Alteryx
- ORACLE

Cloud services

- Amazon Web Services (AWS)
- Google Cloud
- Microsoft Azure

Modeling and actuarial processes

Actuarial modeling

- Moody's AXIS
- FIS Prophet
- MG-ALFA
- Polysystems
- CASE/ArcVal
- KPMG LDTI Tools

Financial reporting and systems

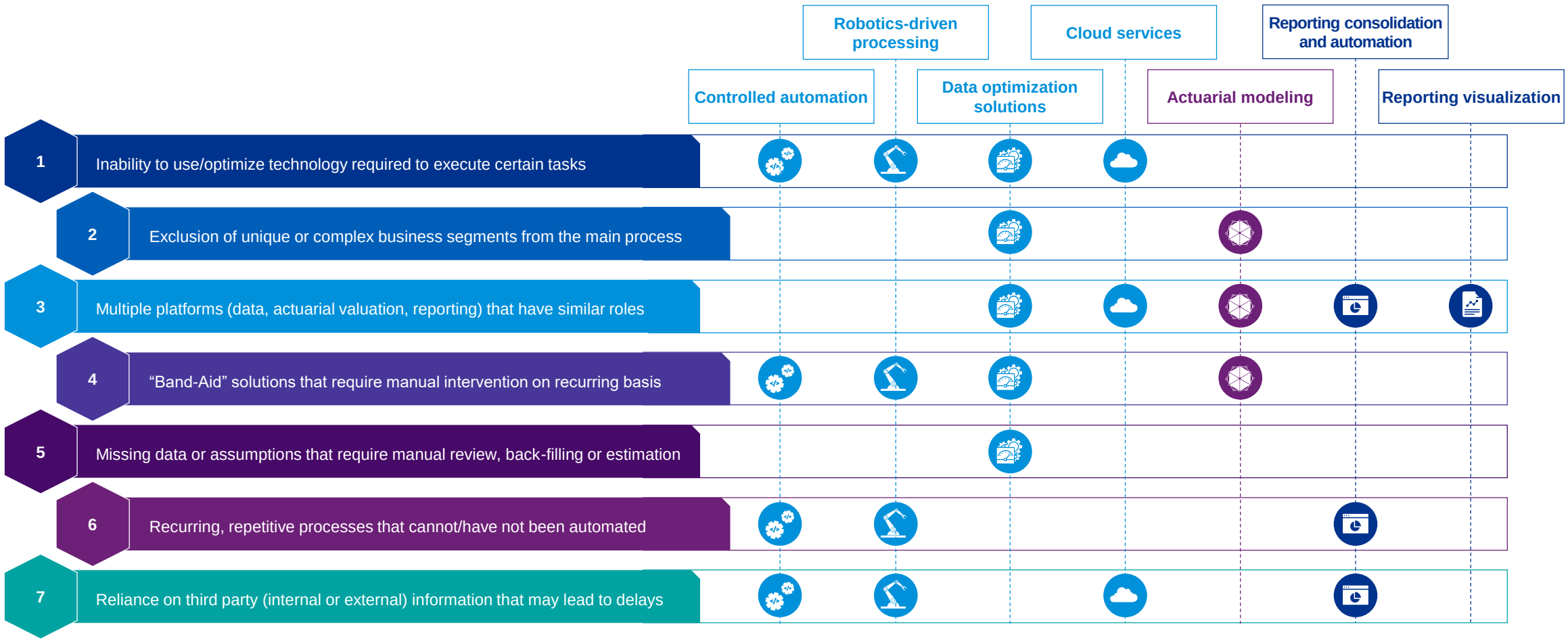
Reporting consolidation and automation

- SAS
- SAP
- Aptitude
- Tagetik

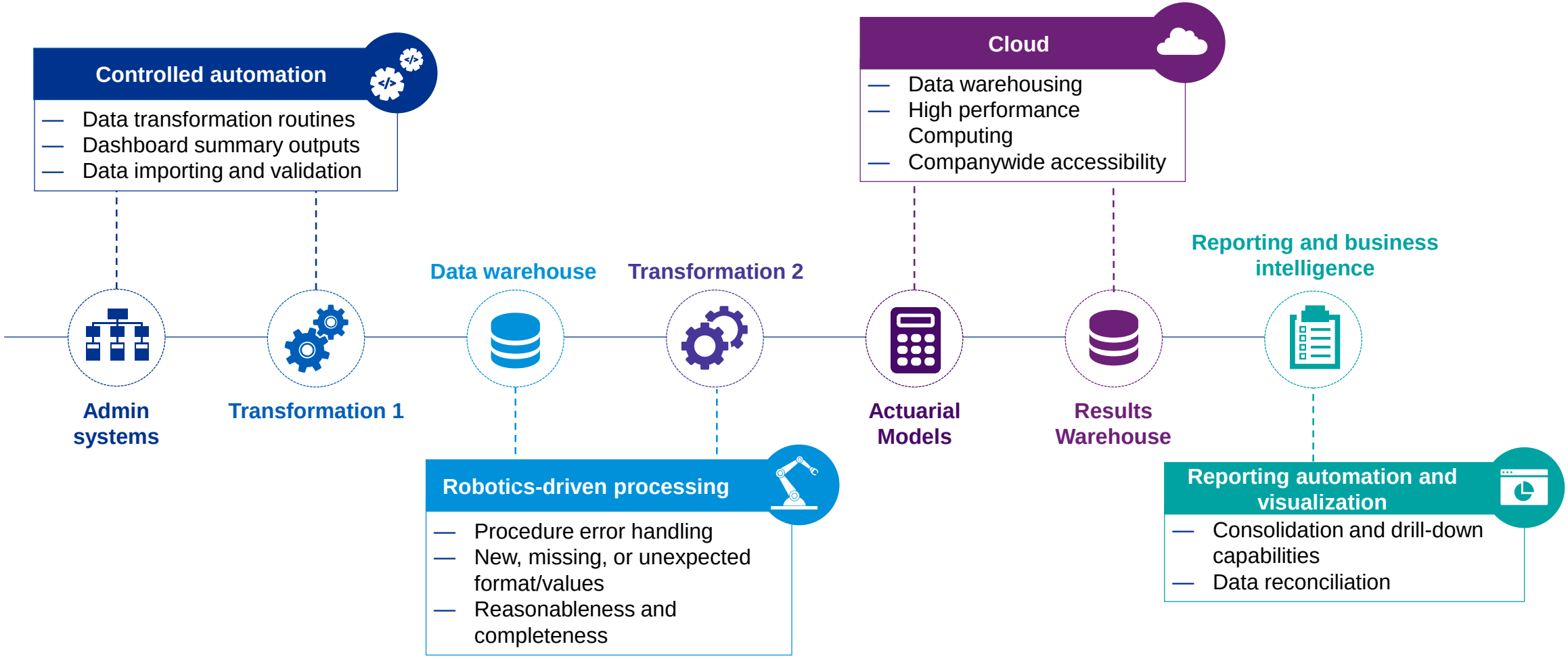
Reporting visualization

- Qlik
- Tableau
- Microsoft Power BI
- TRIBCO Spotfire

Connecting problems with solutions



Solution example: Automation and controls over quarterly actuarial production process



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Case study 1:
Actuarial controls automation

Case study

Robotics process automation (RPA)

What is RPA? What can it do?

Robotics process automation (RPA) is used to build a **digital workforce of robots** that perform rule-based processes. RPA software is designed with the flexibility to work with existing front-end interfaces. This enables automation of activities as a human would perform them.

For example, a bot could be set up to perform the following without any knowledge of the software's underlying code:

- Open a web browser, log in to a webpage, download a file, and manipulate the data
- Launch an ETL process, run a model, and use the model output to populate a spreadsheet or report
- Validate model outputs agree with source files, take screenshots, and document for audit trails

RPA software providers

Blue Prism

Automation Anywhere

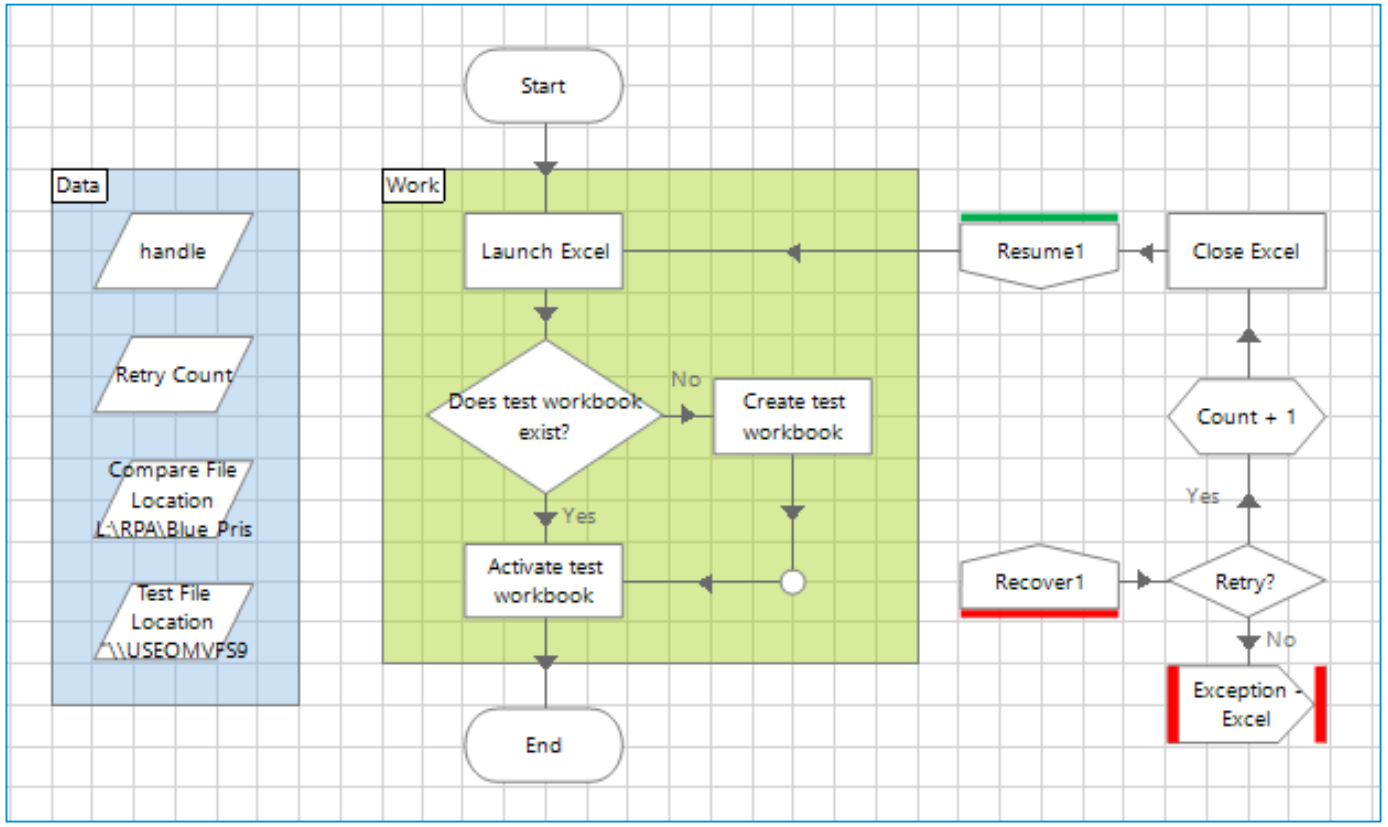
Ui Path

Robotics process automation (RPA) (continued)

Shown below is an example workflow in an RPA Software used to start a program and open a file.

Benefits of RPA software design:

- Low/no code
- Flowchart interface makes it simple for non-users to understand
- Modular design makes possible to reconfigure for multiple use cases



Case study

Robotics process automation (RPA) (continued)

Scenario description

Goal:

Review, redesign, and automate governance over life and retirement products

Tools:

RPA with Blue Prism

Actuarial models

Databases

Four major phases to consider in a control automation initiative:

- Assessment of control effectiveness and design
- Determine automation candidacy
- Develop business requirements
- Automation

What makes this process a good candidate for APO?

Resource constraints	Governance over actuarial processes can have hundreds of controls. Tightening budgets have already driven many companies to an offshore model, but the number and size of controls remains a strain on resources that leads to compromises in cost or effectiveness.
High repetition	Controls often involve repetitive tasks such as reconciling between two or more files. Testing procedures might need to be performed over dozens of files for each control, leading to high chance of human error.
Frequency and speed	Controls are performed in frequent, regular intervals and require quick turnaround.

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Case study 2:
Assumption table validation

Case study

Assumption table validation

Scenario description

Goal:
Validate internal consistency of modeling assumptions

Tools:
Alteryx
Actuarial models
Databases

Using the preconfigured tools in Alteryx, a process of simple reasonability checks was set up to ensure the validity of a company's mortality tables

- **Process:**
  - Retrieve assumption tables and perform reasonability checks
  - Output report of tables with invalid logic
- **Reasonability Checks**
  - Valid range (mortality must be between $0 < q_x < 1$)
  - Monotonicity of attained age (mortality is expected to increase as policyholder ages)
  - Monotonicity of select age (of policyholders with the same issue date, older policyholders are expected to have higher mortality than younger policyholders)
- **Output:**
  - Charts identifying issue ages where invalid mortality occurs
  - Alteryx workflow tools aid the user with investigating errors found in the charts

What made this process a good candidate for APO?

Large number of files

There are likely many assumption tables per block of business, especially when there are multiple valuation basis used and frequent unlocking. This POC is very successful because it can iteratively run through many assumption tables in large batches.

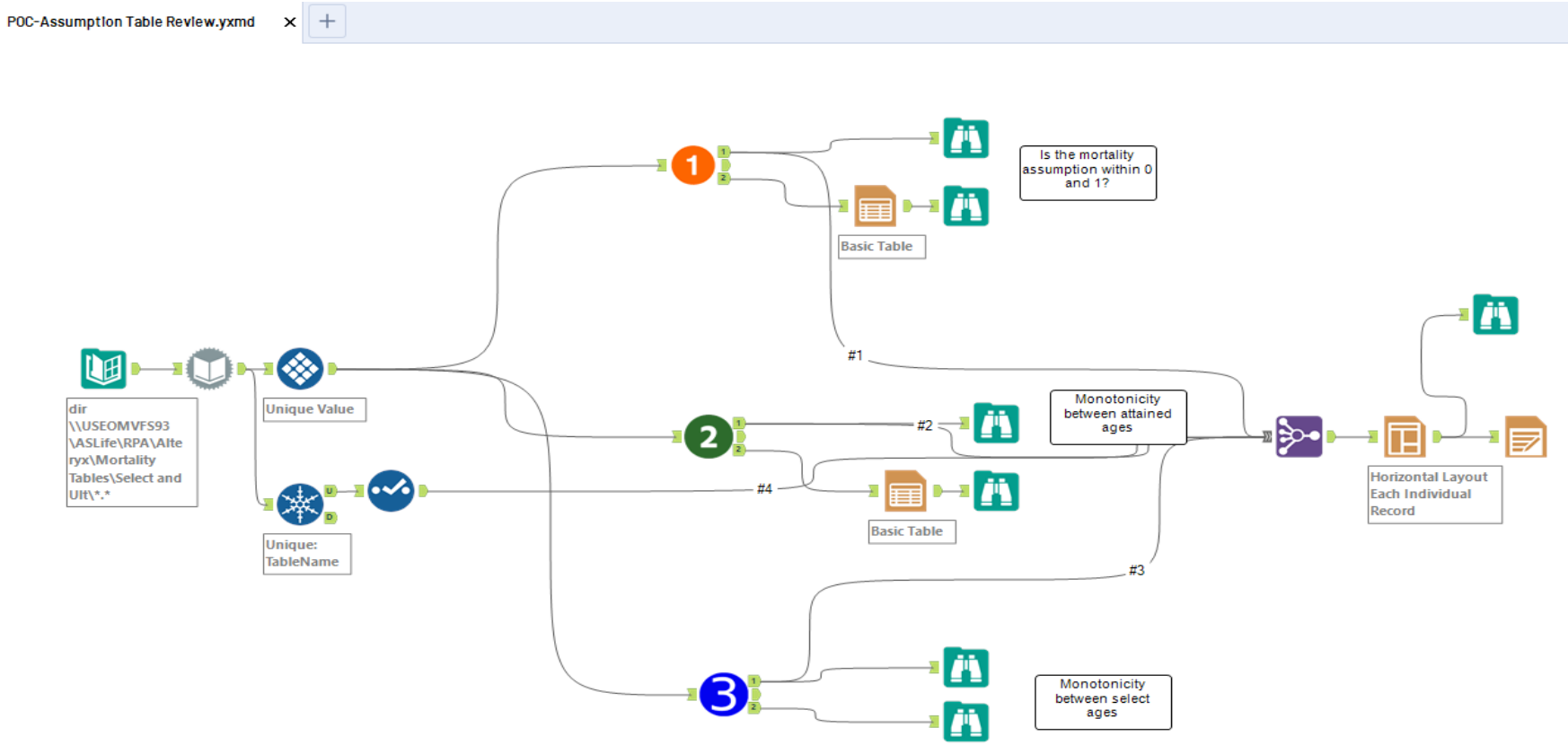
Repeatable process

The inputs to this process are consistent (formatted assumption tables). The reasonability checks were repeatable and easily configured using macros.

Case study

Assumption table validation (continued)

Shown below is the workflow in Alteryx used to run assumption tables through reasonability checks. In the image below, these checks are done with iterative macros labeled as the 1, 2, and 3 tools.



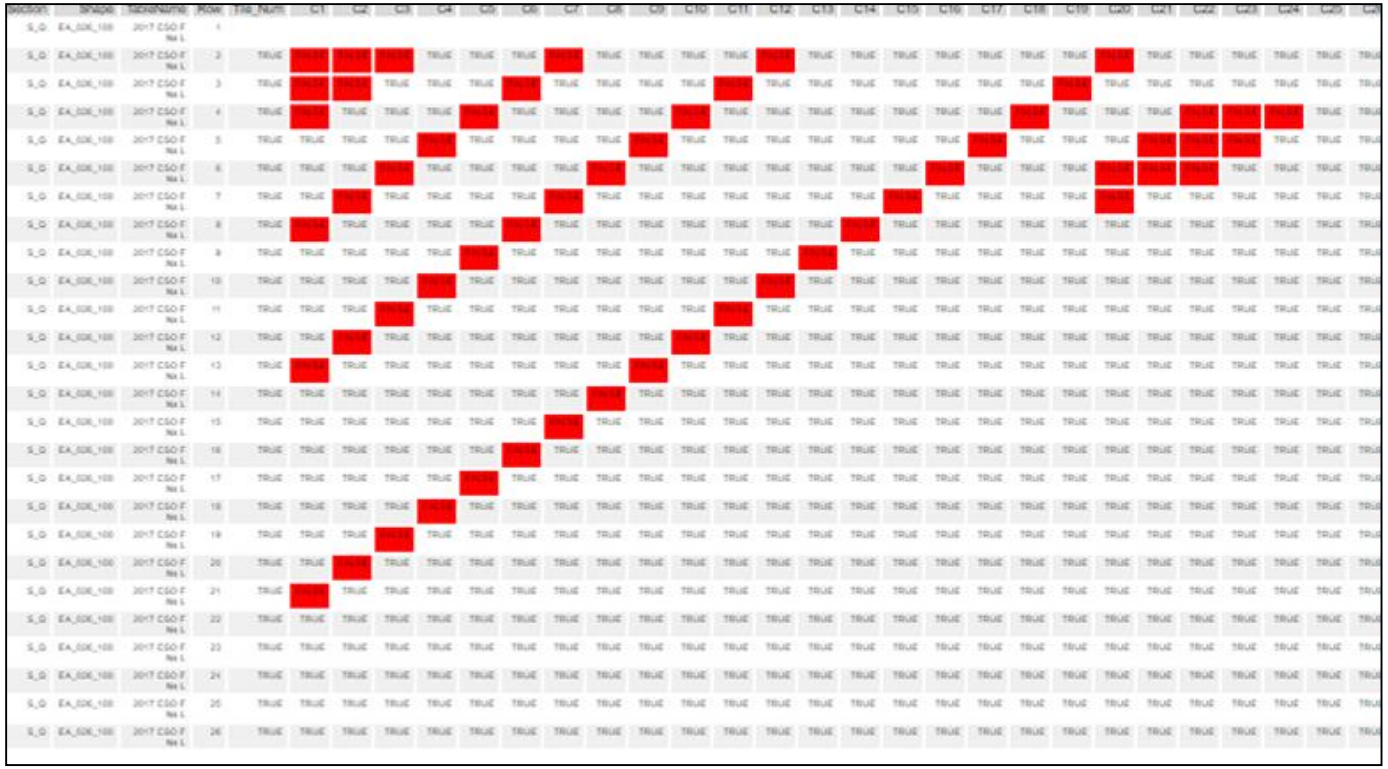
Case study

Assumption table validation (continued)

Shown below is an example of the output from the workflow.

- Validation errors are identified by issue age and select age
- Red cells indicate that mortality decreased as age increased

Test for monotonicity of mortality



Thank you!

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