Process Wind Tunnel for Improving Business Processes

June 20, 2019
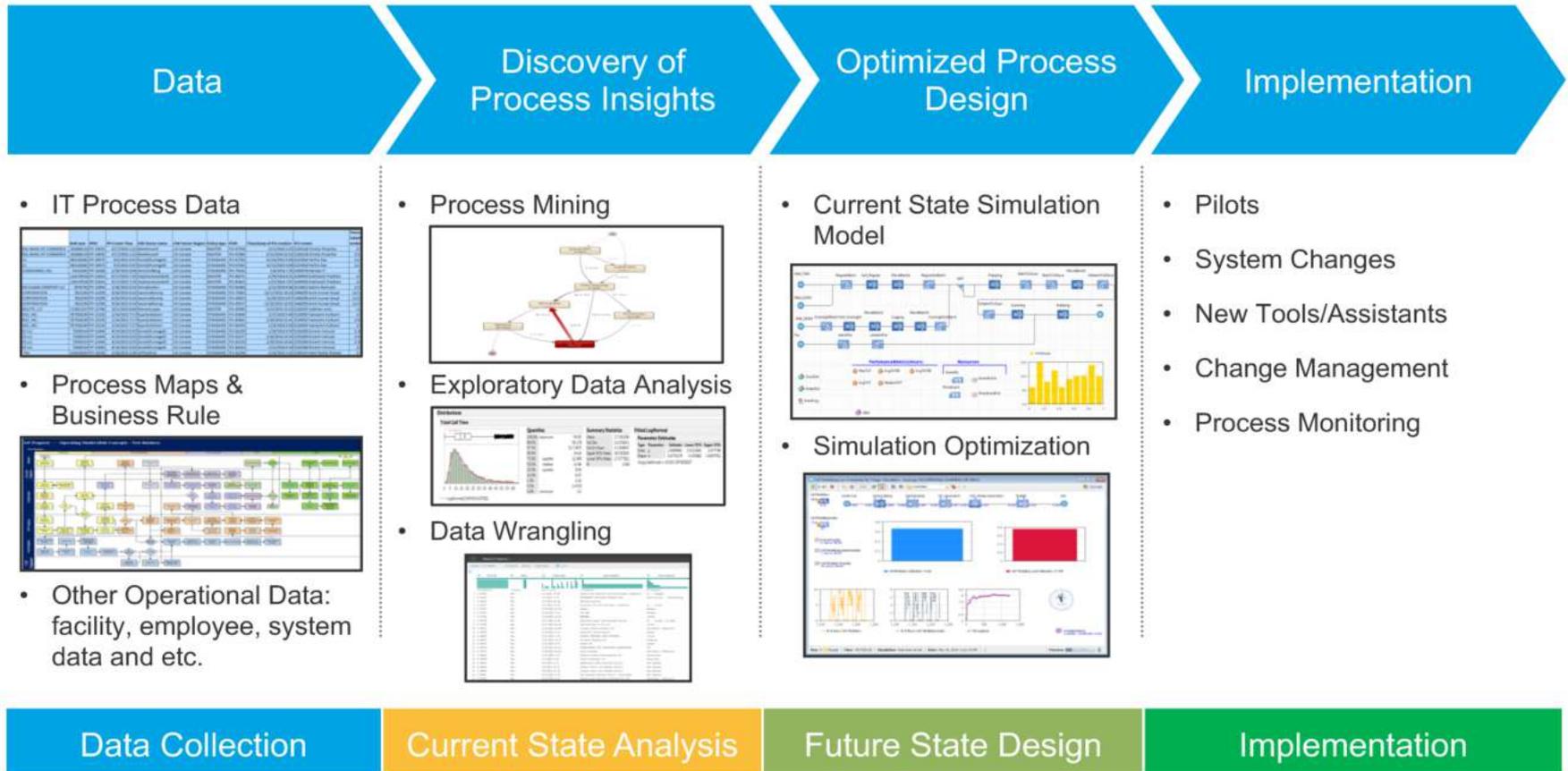
Sudhendu Rai
Lead Scientist – Head of Data-Driven Process Optimization
AIG Investments

Sudhendu.Rai@aig.com

Process Wind Tunnel : Data Science + Operations Research

A virtual modeling and analysis framework and toolkit/platform to evaluate and optimize process structure and parameters using real-world data prior to committing to final process design

Data	Discovery of Process Insights	Optimized Process Design	Implementation

Data
- IT Process Data

- Process Maps & Business Rule

- Other Operational Data: facility, employee, system data and etc.

Discovery of Process Insights
- Process Mining

- Exploratory Data Analysis

- Data Wrangling

Optimized Process Design
- Current State Simulation Model

- Simulation Optimization

Implementation
- Pilots
- System Changes
- New Tools/Assistants
- Change Management
- Process Monitoring

Data Collection	Current State Analysis	Future State Design	Implementation

AIG

Wind Tunnel Project Vision

Improve profits through transformation of process design and management

Traditional approach to process improvement

Traditional methodology coupled with (mostly) **qualitative** tools and **reporting** methods
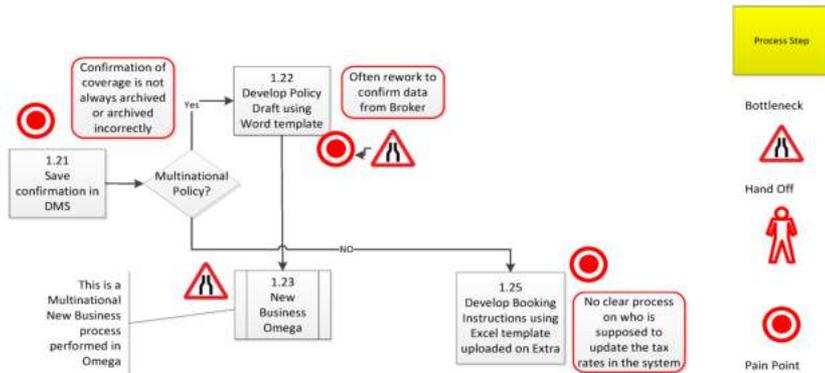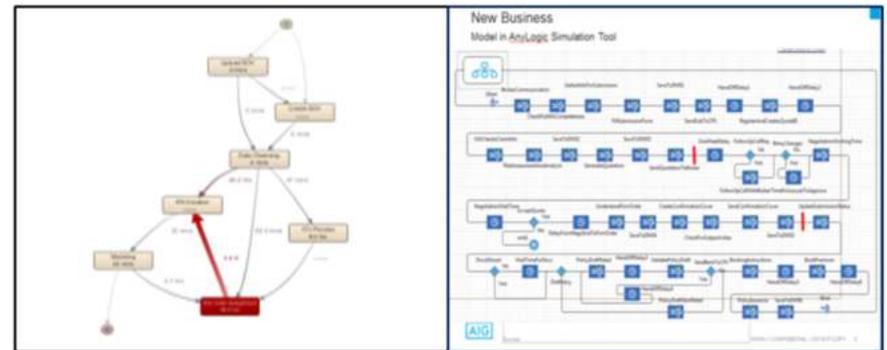

Identify hand-offs, bottlenecks and pain points through qualitative interviews and process mapping

Lots of People

Wind Tunnel based approach to process improvement

Data-driven **state-of-the-art quantitative** tools and **analytics** for process-related decision-making at **all** management levels

Utilize process mining, discrete-event simulation models and data-driven optimization for diagnosis and improvement

Less People   Data   Analytics

Objectives

Develop solutions to improve the **operational efficiency and business results** of *policy underwriting* using the Wind Tunnel approach and evaluate the potential to expand the solution to other operations

Business Problem	Value and Impact	Technologies

Business Problem

- Goal: Improve underwriting business results

- How can we develop and use data-driven scientific methods to:
  - Reduce cycle time
  - Increase capacity
  - Improve customer satisfaction

Value and Impact

- Increase capacity and thus more premium can be captured

- Reduce TAT

- Improve business performance

Technologies

- Process data analytics

- Process Mining

- Discrete-event simulation

High-Level Process Overview

Quote Accepted   Bound   Policy Issued

Quote Sent

Submission Entered   Booked

| Submission Entered | Quote Sent | Quote Accepted | Bound | Booked | Policy Issued |
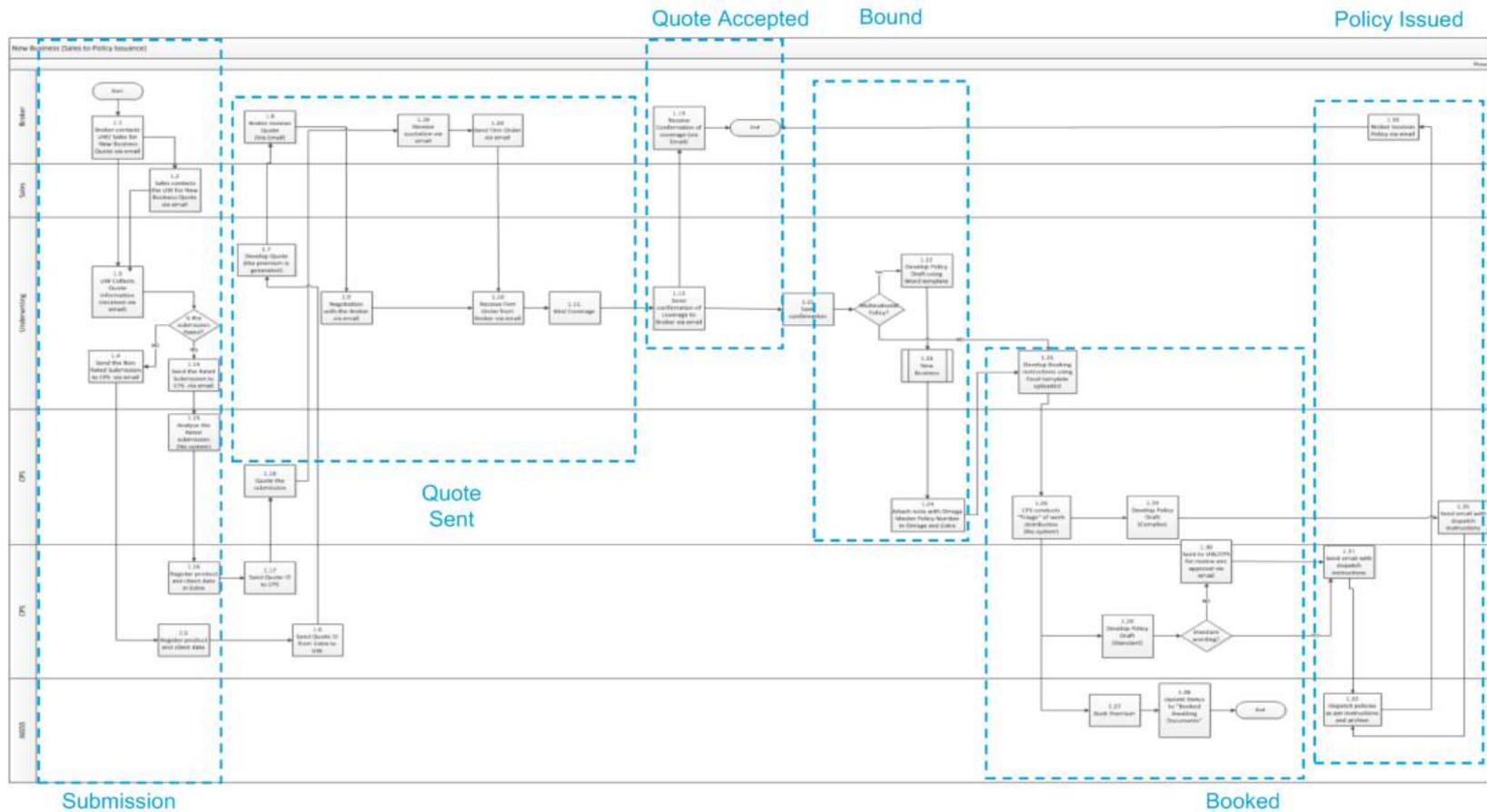
Process Data Acquisition and Wrangling

Develop process maps and extract data from multiple IT business applications

| New Business | Renewals | Mid-Term Adjustments |

109 attributes
4510 records

117 attributes
6651 records

46 attributes
11144 records

In-depth analysis to Gain Business & Operational Insights and Establish Quantitative Metrics

Exploratory statistical analysis, visualization and process mining tools & methods are developed and utilized
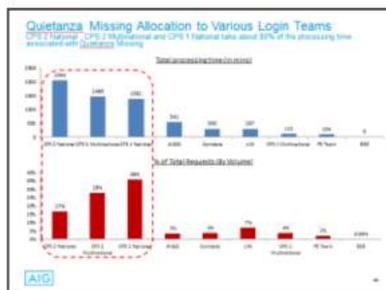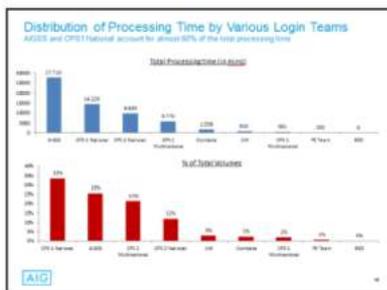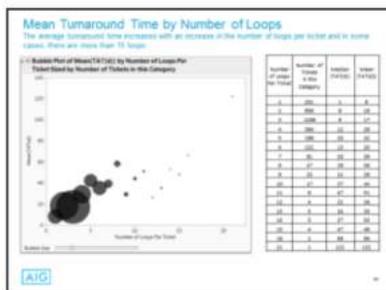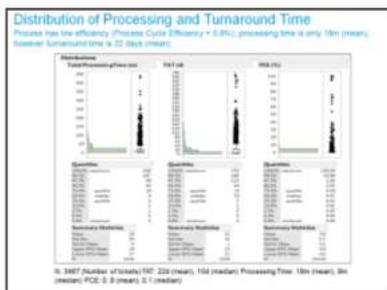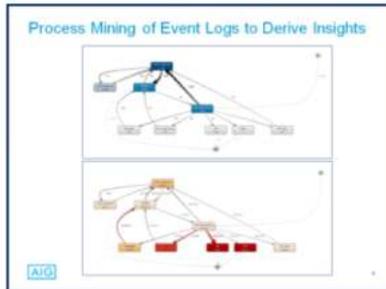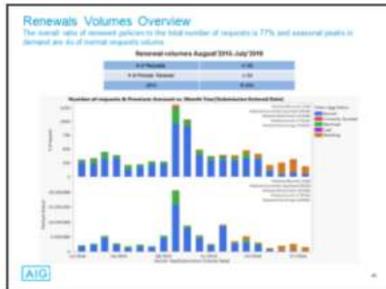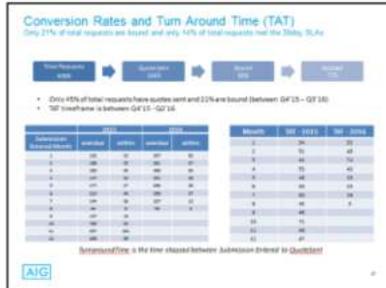
Process Mining of Event Logs to Get Insights on The Current Process

Process mining helps us see how the service requests flow between various teams and where most time is being spent
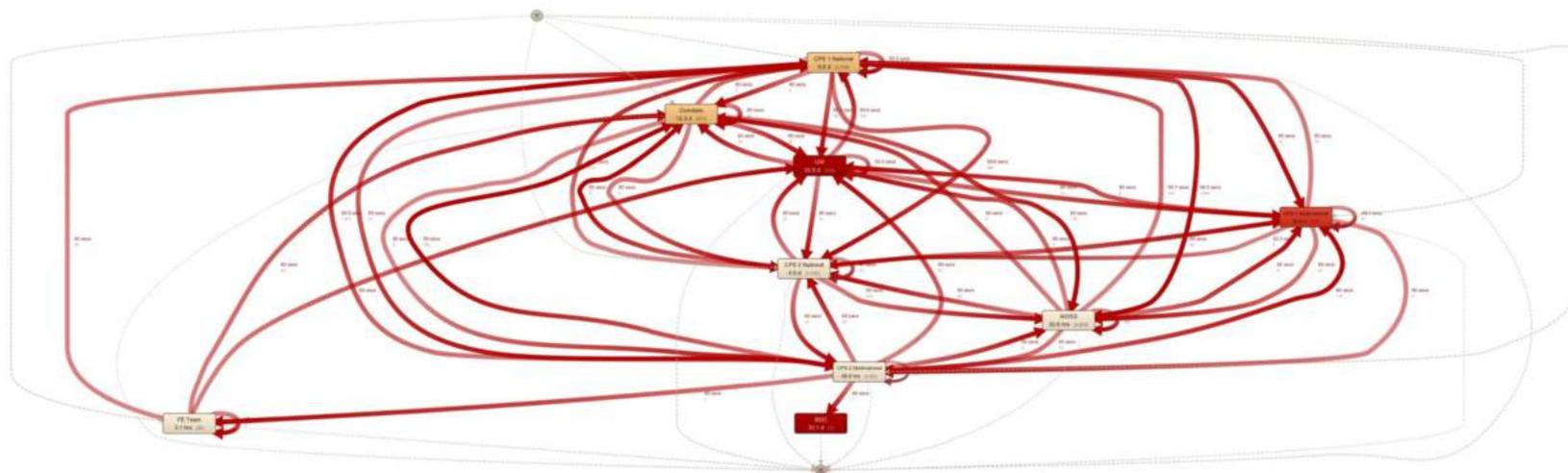
From current state analysis to future state design

- After establishing the baseline analyzing current state data, the next phase is the development of an improved future state design
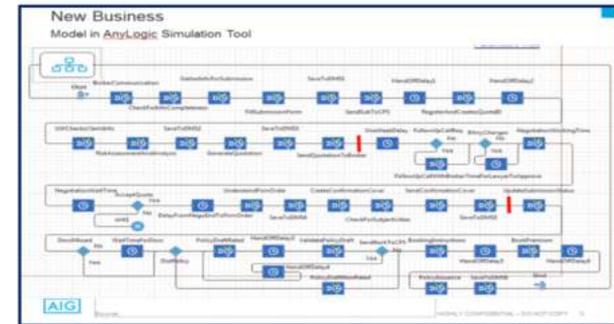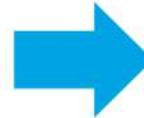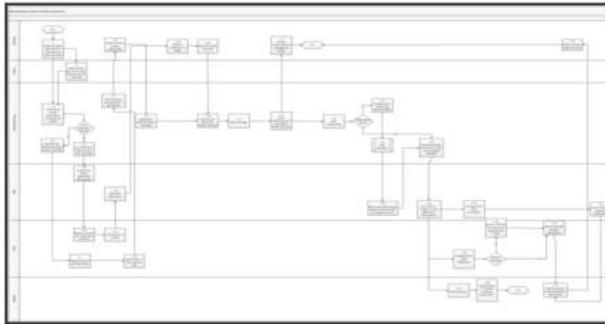
- Discrete-event simulation is a key tool that is utilized in this next phase

Leveraging process mining for developing "good" simulation models

Process mining helps us in understanding which steps are critical to include in the simulation models and which can be ignored

Process mining enables us to extract some key inputs to simulation models

- Critical steps and paths to include in the model
- Granularity of the model
- Processing time distributions
- Transition probabilities
- …

Tail Scheduling

Uncertainty and high variability in processing rate information makes classical deterministic scheduling ineffective

- We utilize concepts from tail scheduling developed for distributed computing to develop effective task allocation solutions and validate them via simulations
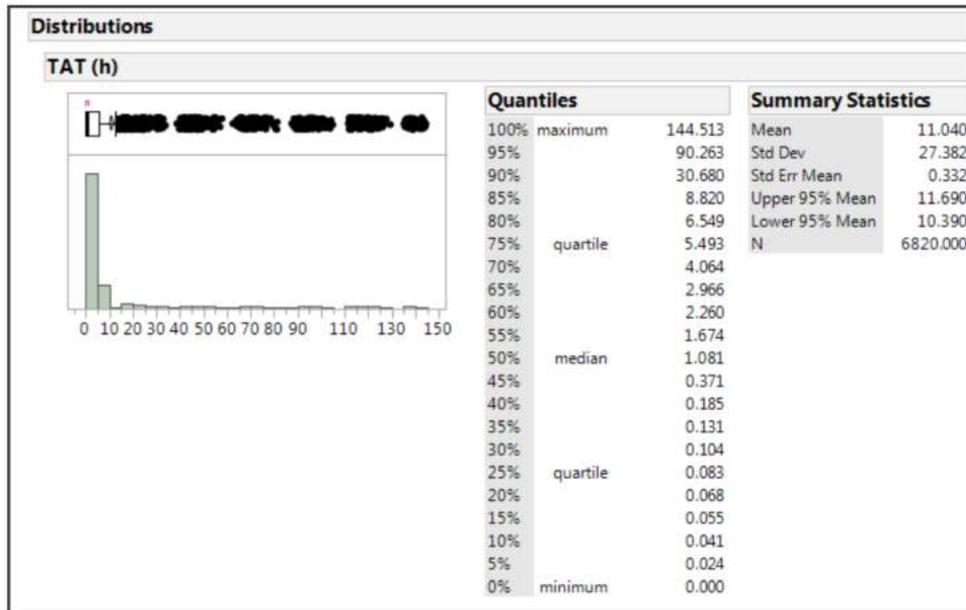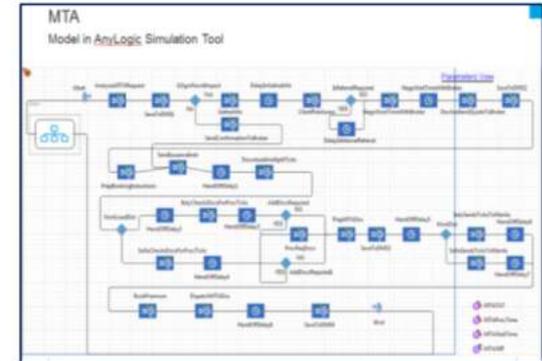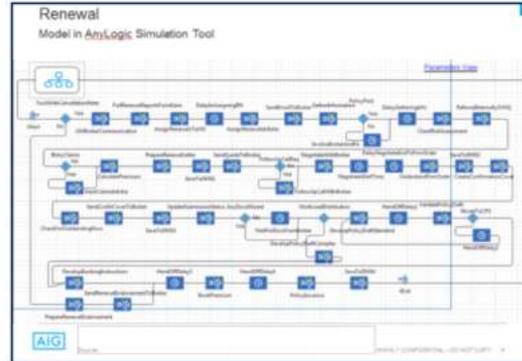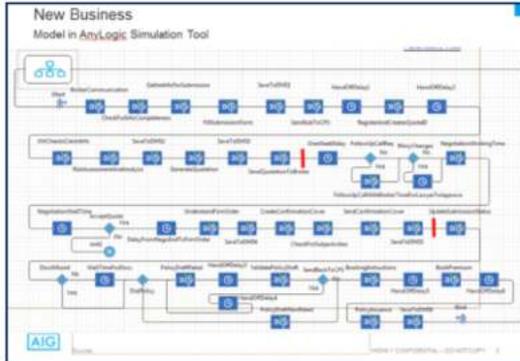

A non-normal Turnaround Time distribution with a long tail can indicate highly dissatisfied customers even though mean may be acceptable
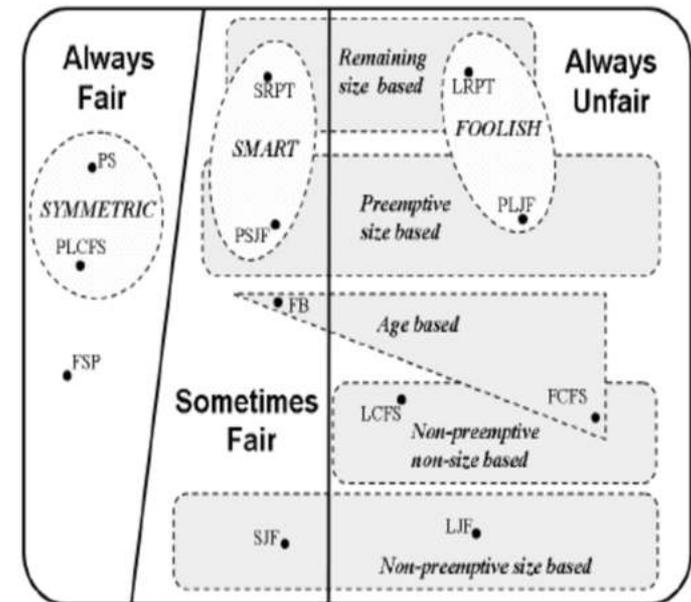
Wierman, Adam. "Fairness and classifications." *ACM SIGMETRICS Performance Evaluation Review* 34.4 (2007): 4-12.

Data-Driven Discrete-Event Simulation Models

Model-based prediction and performance optimization to develop process change recommendations

Proposed Scheduling Policy:
Two-stage time-based Task Prioritization is adopted for benchmarking pilot study. Incoming policy requests are prioritized based on their class and tail scheduling policies are utilized to improve cycle time and throughput.
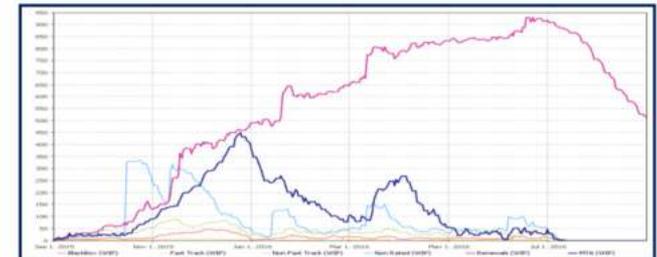
Pilot

Develop tools to pilot and validate process changes

Results:

Cycle times were reduced from 12d to 5d and throughput increased by over 30%

Process Mining Event Logs After Making Process Changes

The event logs from the new process can be mined to evaluate changes in key process metrics

Process Wind Tunnel : Data Science + Operations Research

A virtual modeling and analysis framework and toolkit/platform to evaluate and optimize process structure and parameters using real-world data prior to committing to final process design

| Data | → | Discovery of Process Insights | → | Optimized Process Design | → | Implementation |

IT Process Data

Process Maps & Business Rule

Other operational data

Facility, employee, system data

Process Mining

Exploratory Data Analysis

Data Wrangling

Simulation Optimization

- Pilots
- System changes
- New Tools/Assistants
- Change management
- Process monitoring

| Data Collection | Current State Analysis | Future State Design | Implementation |
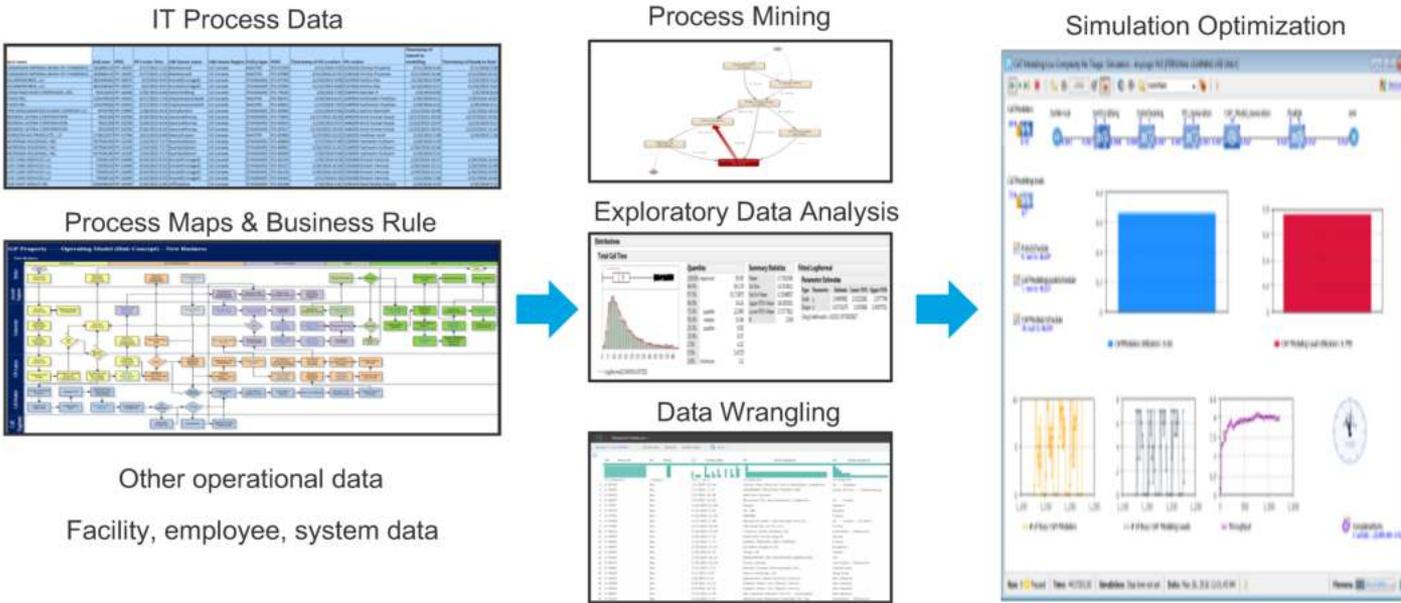
Process wind tunnel can deliver 30% productivity improvement across a large class of business processes

AIG