



Process Wind Tunnel for Improving Business Processes

June 20, 2019

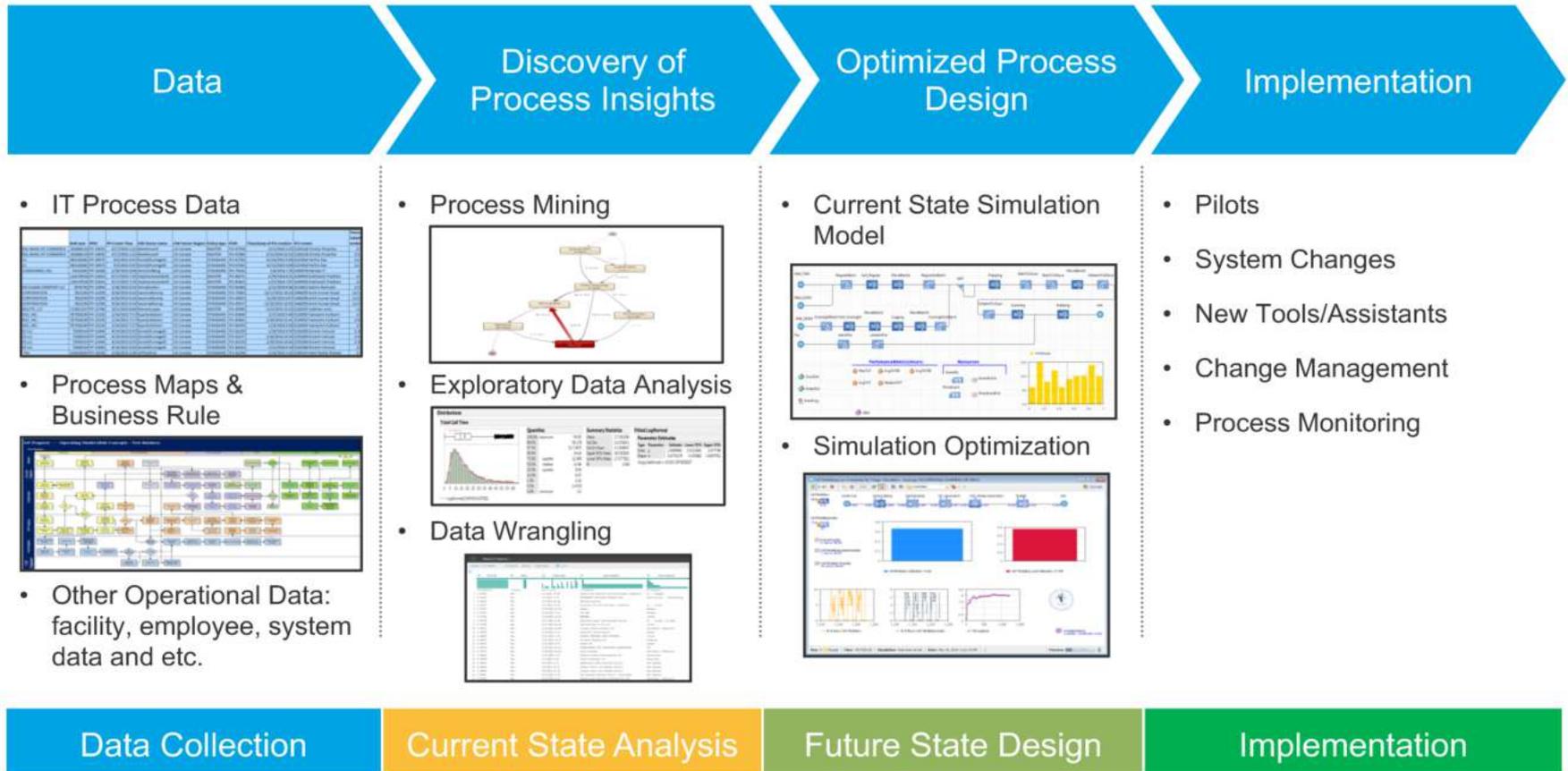
Sudhendu Rai

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

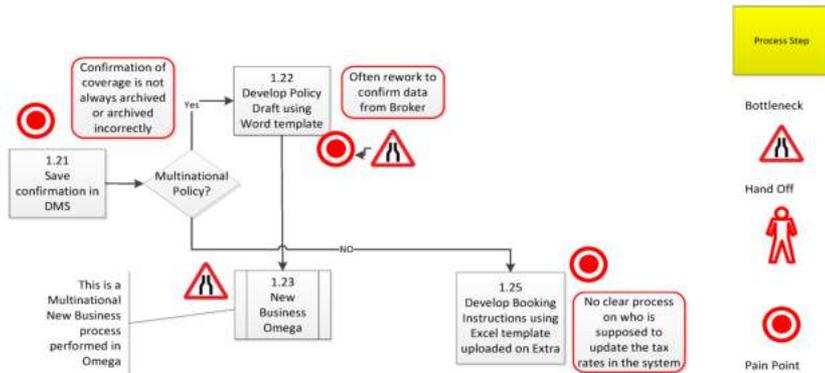


Wind Tunnel Project Vision

Improve profits through transformation of process design and management

Traditional approach to process improvement

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



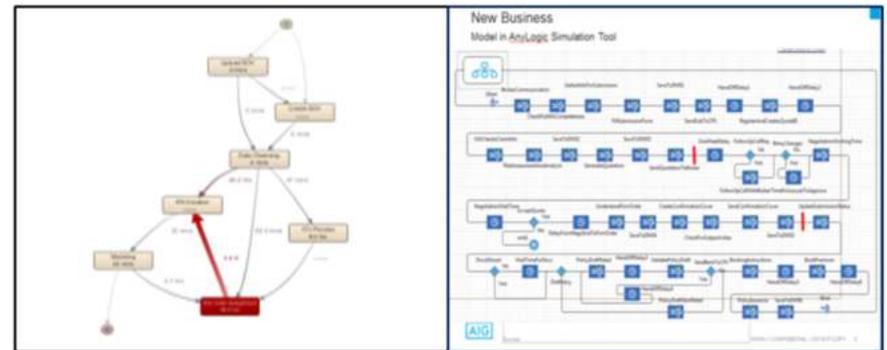
Identify hand-offs, bottlenecks and pain points through qualitative interviews and process mapping



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

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

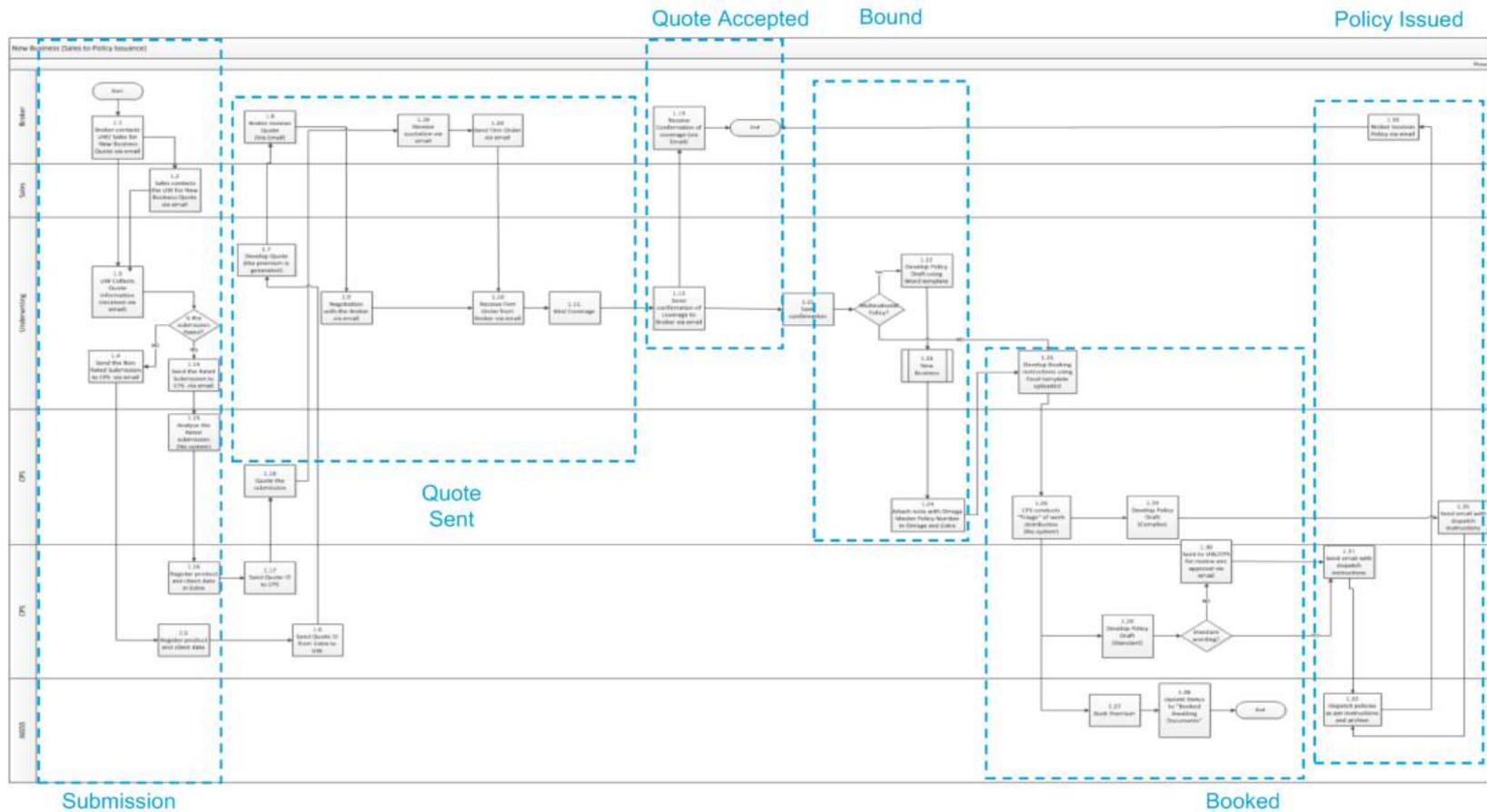
Value and Impact

- Increase capacity and thus more premium can be captured
- Reduce TAT
- Improve business performance

Technologies

- Process data analytics
- Process Mining
- Discrete-event simulation

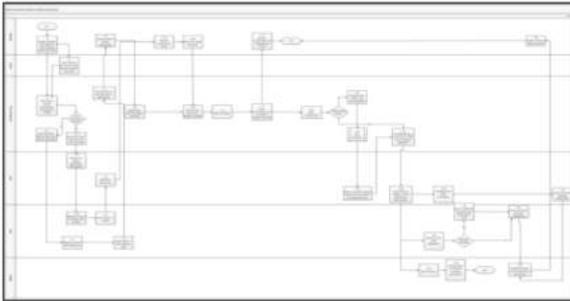
High-Level Process Overview



Process Data Acquisition and Wrangling

Develop process maps and extract data from multiple IT business applications

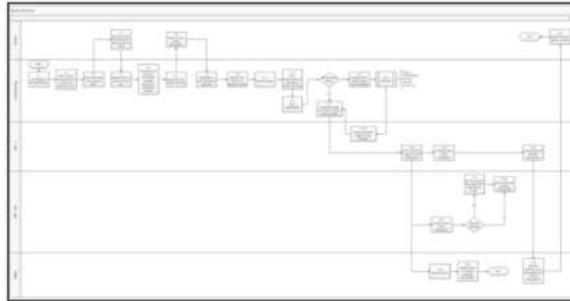
New Business



Submission No.	Status	App Received Date	Quote Sent Original Date	Bound Date	Booked Date	Policy Issued Date	Product Type
85114629	Booked	05/04/2015 12:00 AM	05/04/2015	05/04/2015	05/15/2015	05/15/2015	Rated
89179749	Booked	05/05/2015 12:00 AM	05/07/2015	05/07/2015	05/08/2015	05/11/2015	Non Rated
240118629	Void	05/04/2015 12:00 AM					Rated
197980730	Void	05/11/2015 12:00 AM					Rated
74743628	Booked	05/07/2015 12:00 AM	05/07/2015	05/07/2015	05/12/2015	05/07/2015	Rated
99440411	Booked	05/05/2015 12:00 AM	05/07/2015	05/07/2015	05/11/2015	05/11/2015	Non Rated
412480797	Booked	05/06/2015 12:00 AM	05/08/2015	05/08/2015	05/12/2015	05/12/2015	Non Rated
82678639	Void	05/06/2015 12:00 AM					Non Rated
54236252	Booked	05/18/2015 12:00 AM	05/18/2015	05/18/2015	05/19/2015	05/20/2015	Rated
93281808	Void	05/14/2015 12:00 AM					Rated
90223628	Void	05/03/2015 12:00 AM					Rated
798234075	Booked	05/04/2015 12:00 AM	05/04/2015	05/04/2015	05/06/2015	05/21/2015	Non Rated
84955303	Booked	05/04/2015 12:00 AM	05/21/2015	05/21/2015	05/22/2015	05/27/2015	Rated
64847028	Void	05/19/2015 12:00 AM					Rated
75978902	Void	05/21/2015 12:00 AM					Rated
39189474	Void	05/14/2015 12:00 AM					Rated
85148748	Void	05/22/2015 12:00 AM					Rated
12614278	Booked	05/14/2015 12:00 AM	05/21/2015	05/21/2015	05/22/2015	05/28/2015	Rated
89881890	Booked	05/14/2015 12:00 AM	05/21/2015	05/21/2015	05/22/2015	05/28/2015	Rated
67949622	Booked	05/20/2015	05/20/2015	05/20/2015	05/20/2015	05/28/2015	Rated

109 attributes
4510 records

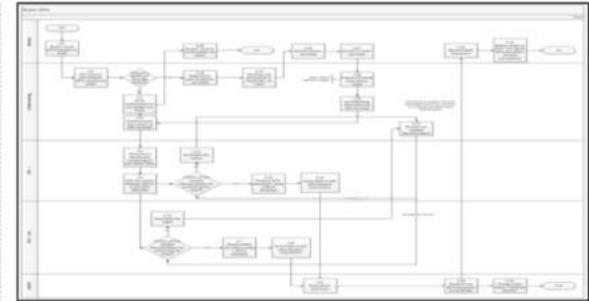
Renewals



Policy No	Sub Status Level2	Submission Entered Date	Quote Orig Date	Bound Date	Booked Date	Policy Date	Client Name	Premium Amount	Sub Status Code
000051028	Renewal - Booked	02/04/2015	30/09/2015	30/09/2015	21/06/2015	21/06/2015	01-421336	34880	W
000051028	Renewal - Review	02/04/2015	30/09/2015	30/09/2015	21/06/2015	21/06/2015	01-421336	35800	W
000051048	Renewal - Booked	02/04/2015	04/10/2015	04/10/2015	17/06/2015	17/06/2015	01-521856	4200	W
000051048	Renewal - Booked	02/04/2015	30/09/2015	30/09/2015	30/09/2015	30/09/2015	01-521856	4200	W
000051057	Renewal - Booked	23/09/2015	01/01/2015	01/01/2015	09/01/2015	09/01/2015	01-438466	202188	W
000051057	Renewal - Booked	04/01/2015	19/06/2015	19/06/2015	10/06/2015	10/06/2015	01-438466	159788	W
000051057	Renewal - Review	23/09/2015					01-438466	302188	W
000051059	Renewal - Booked	02/04/2015	23/06/2015	23/06/2015	12/06/2015	12/06/2015	01-481634	2690	W
000051061	Renewal - Booked	02/04/2015			22/06/2015	22/06/2015	01-523794	1150	W
000051068	Renewal - Booked	09/06/2015	02/10/2015	02/10/2015	06/10/2015	06/10/2015	01-487824	1000	W
000051068	Renewal - Booked	02/04/2015	18/10/2015	18/10/2015	18/10/2015	18/10/2015	01-487824	1000	W
000051068	Renewal - Declined	08/06/2015					01-443934	25730	W
000051068	Renewal - Declined	08/06/2015					01-443934	25730	W
000051068	Renewal - Declined	08/06/2015					01-443934	25730	W
000051068	Renewal - Booked	17/06/2015	02/10/2015	02/10/2015	06/10/2015	06/10/2015	01-487824	2690	W

117 attributes
6651 records

Mid-Term Adjustments

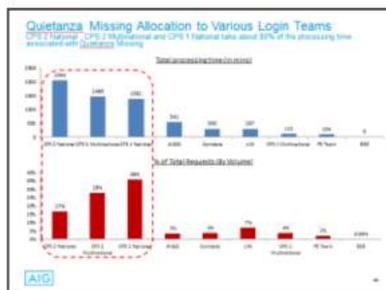
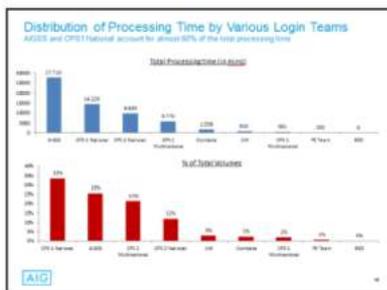
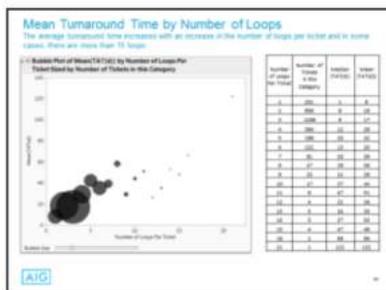
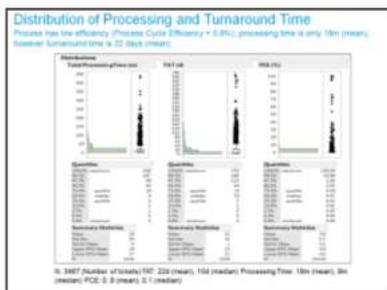
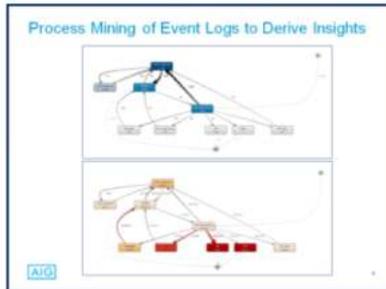
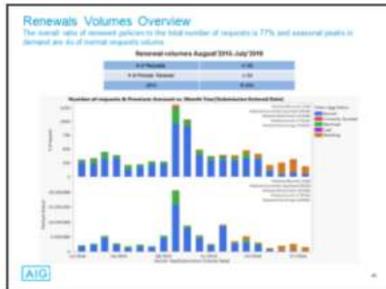
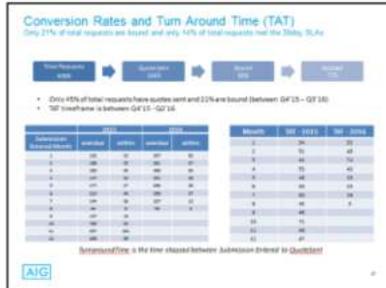


ID	Creation Date	Result Date	Login Team	Queue
35238	2015/05/04 12:29:55	2015/10/12 3:53:45...	CPS 1 National	To classify
35239	2015/05/04 12:29:55	2015/10/13 4:52:55...	CPS 1 National	Endorsment Fin. Lines National
35244	2015/05/04 12:48:00	2015/05/04 2:26:19...	FE Team	Mail to sort
35245	2015/05/04 12:48:00	2015/06/03 12:28:3...	Comdata	DOCs F L National
35246	2015/05/04 12:48:00	2015/06/05 12:24:5...	UW	UW F L Instr. or Auth.
35247	2015/05/04 12:48:00	2015/06/08 2:18:47...	Comdata	CPS1 F L Issuing National
35337	2015/05/04 4:40:30	2015/05/04 4:44:19...	CPS 2 Multinational	Mail to sort
35338	2015/05/04 4:40:30	2015/06/03 4:16:48...	CPS 1 National	DOCs F L National
35485	2015/05/05 9:38:51	2015/05/05 9:46:40...	CPS 2 Multinational	Mail to sort
35486	2015/05/05 9:38:51	2015/06/03 4:21:25...	CPS 1 National	DOCs F L National
35525	2015/05/05 10:49:10	2015/05/05 10:57:5...	CPS 2 Multinational	Mail to sort
35526	2015/05/05 10:49:10	2015/06/03 4:39:00...	CPS 1 National	DOCs F L National
35572	2015/05/05 11:39:50	2015/05/05 11:58:2...	FE Team	Mail to sort
35573	2015/05/05 11:39:50	2015/06/03 5:35:01...	CPS 1 National	DOCs F L National
35675	2015/05/05 2:09:12	2015/05/05 2:52:04...	CPS 2 Multinational	Mail to sort

46 attributes
11144 records

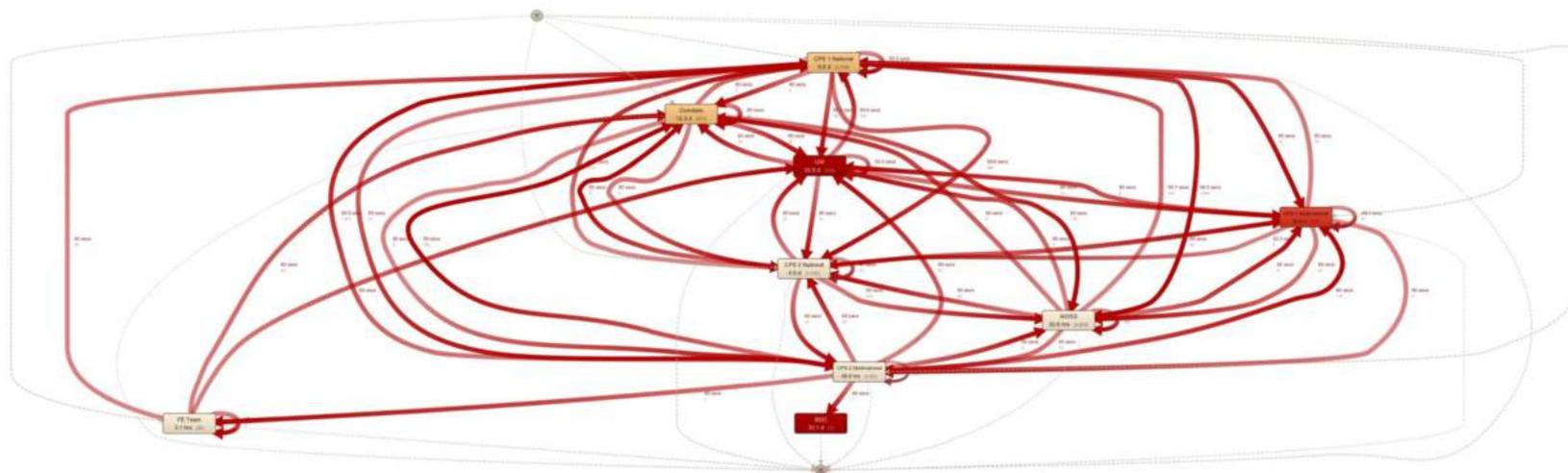
In-depth Analysis to Gain Business & Operational Insights and Establish Quantitative Metrics

Exploratory statistical analysis, visualization and process mining tools & methods are developed and utilized



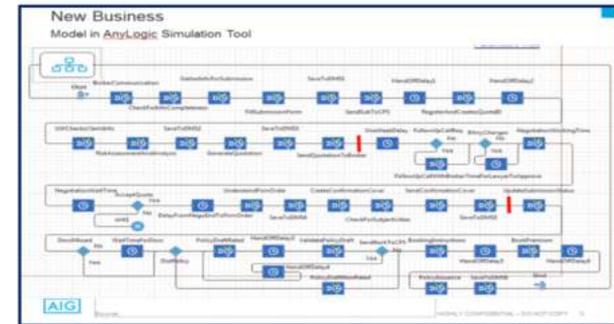
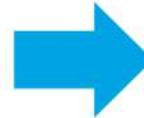
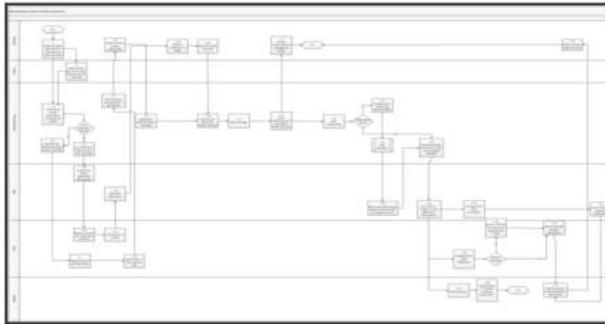
Process Mining of Event Logs to Get Insights on The Current Process

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

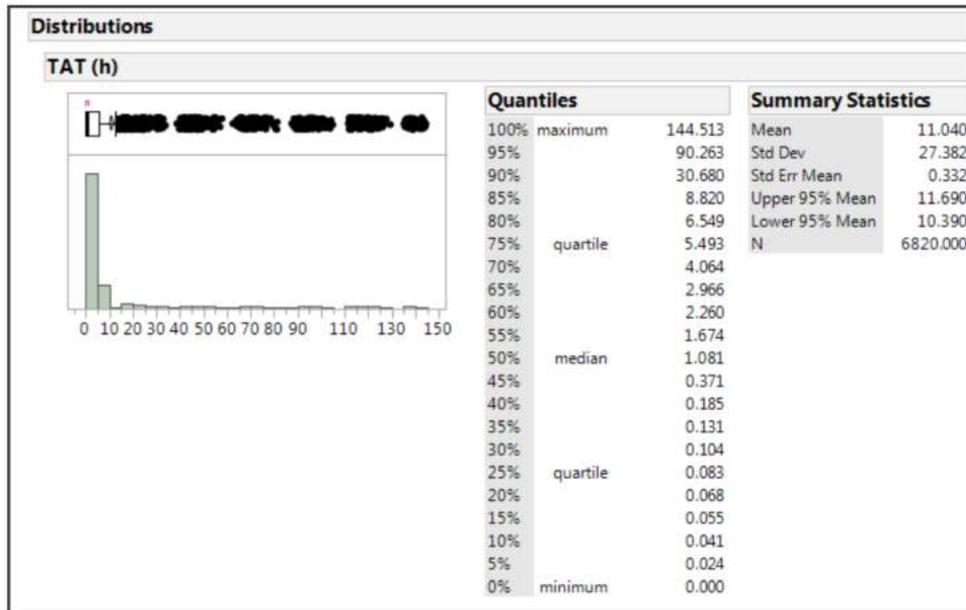


- Discrete-event simulation is a key tool that is utilized in this next phase

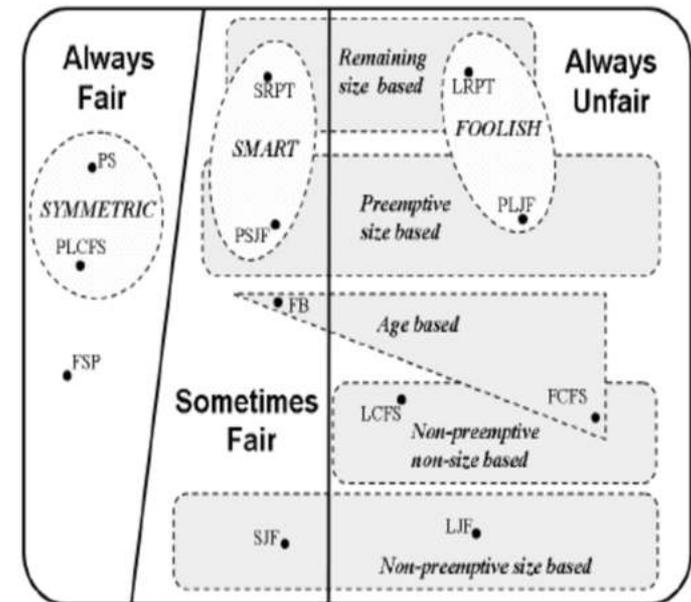
Tail Scheduling

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



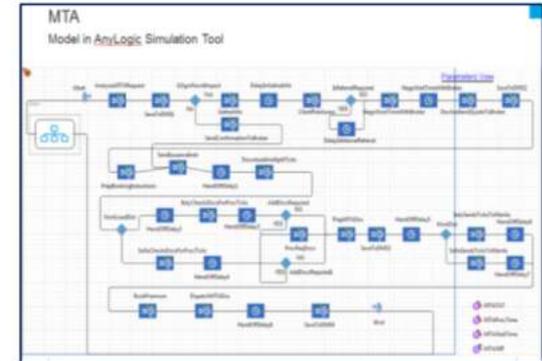
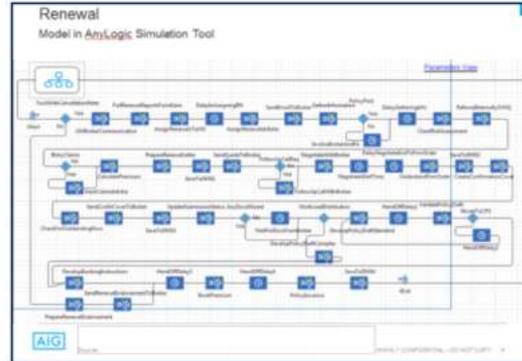
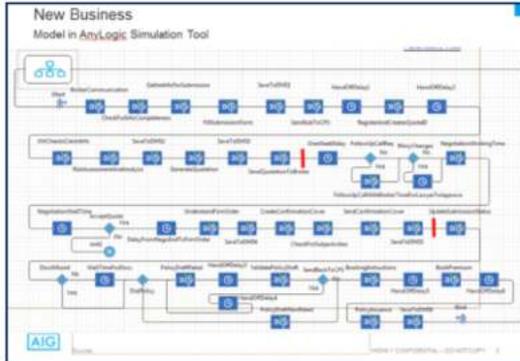
A non-normal Turnaround Time distribution with a long tail can indicate highly dissatisfied customers even though mean may be acceptable



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



Simulation Results

Performance Metric	New Business				Renewals & MTA	
	Black Box	Fast Track	Non-Fast Track	Non-Rated	Renewals	MTA
Average TAT (Days)	114	243	114	138	19	77
Average Processing Time(hrs)	9	9	15	32	5	6
Average WP	258	22	291	776	629	862

Performance Metric	New Business				Renewals & MTA	
	Black Box	Fast Track	Non-Fast Track	Non-Rated	Renewals	MTA
Average TAT (Days)	17	18	17	20	21	12
Average Processing Time(hrs)	9	9	14	17	9	4
Average WP	18	3	40	109	615	127

Simulation Results (Cont'd)

Performance Metric	Black Box	Fast Track	Non-Fast Track	Non-Rated	
Average TAT (Days) - SS&C	17	18	17	20	Overall TAT increases
Average TAT (Days) - SS&K	24	23	22	29	
Average WP (Days) - SS&K	18	2	48	129	
Average WP (Days) - SS&C	22	2	45	89	

Performance Metric	New Business			
	Black Box	Fast Track	Non-Fast Track	Non-Rated
Received to Quote Sent (Days) - SS&C	4	3	3	6
Received to Quote Sent (Days) - SS&K	3	2	3	5
Received to "Send Confirmation Cover" (Days) - SS&C	14	15	15	18
Received to "Send Confirmation Cover" (Days) - SS&K	14	13	13	17
"Send Confirmation Cover" to Issue (Days) - SS&C	3	3	3	2
"Send Confirmation Cover" to Issue (Days) - SS&K	10	10	8	12

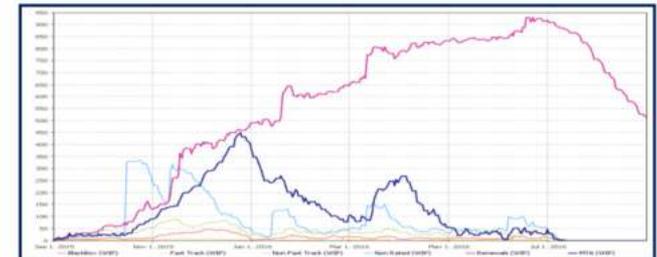
Simulation Results (Cont'd)

Performance Metric	New Business			
	Black Box	Fast Track	Non-Fast Track	Non-Rated
Average TAT (Days) - SS&C	24	23	22	29
Average TAT (Days) - SS&K	24	24	22	29
Average WP (Days) - SS&C	22	2	45	89
Average WP (Days) - SS&K	22	2	45	91

Performance Metric	New Business			
	Black Box	Fast Track	Non-Fast Track	Non-Rated
Received to Quote Sent (Days) - SS&C	3	2	3	5
Received to Quote Sent (Days) - SS&K	3	2	3	5
Received to "Send Confirmation Cover" (Days) - SS&C	14	13	13	17
Received to "Send Confirmation Cover" (Days) - SS&K	14	13	13	17
"Send Confirmation Cover" to Issue (Days) - SS&C	10	10	8	12
"Send Confirmation Cover" to Issue (Days) - SS&K	10	10	8	12

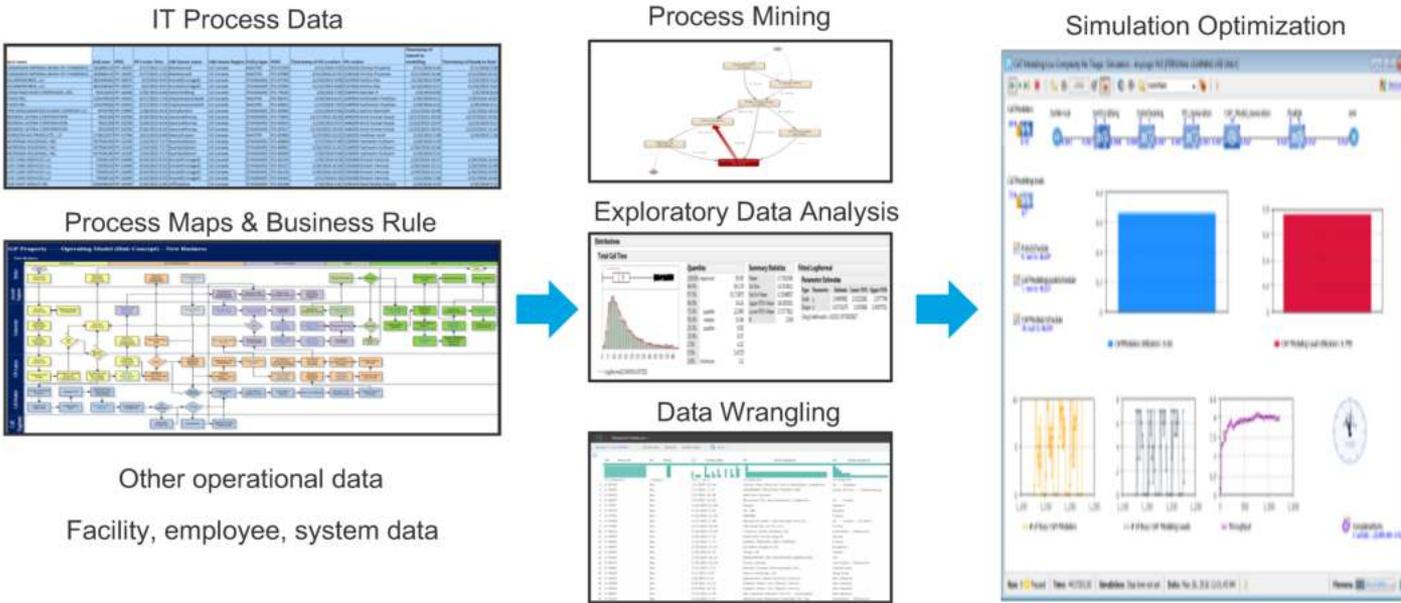
Proposed Scheduling Policy:

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.



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



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



Process wind tunnel can deliver 30% productivity improvement across a large class of business processes