



Viab! Alternative to Reactive Inbound Service Queues

Final Presentation

5/25/2017

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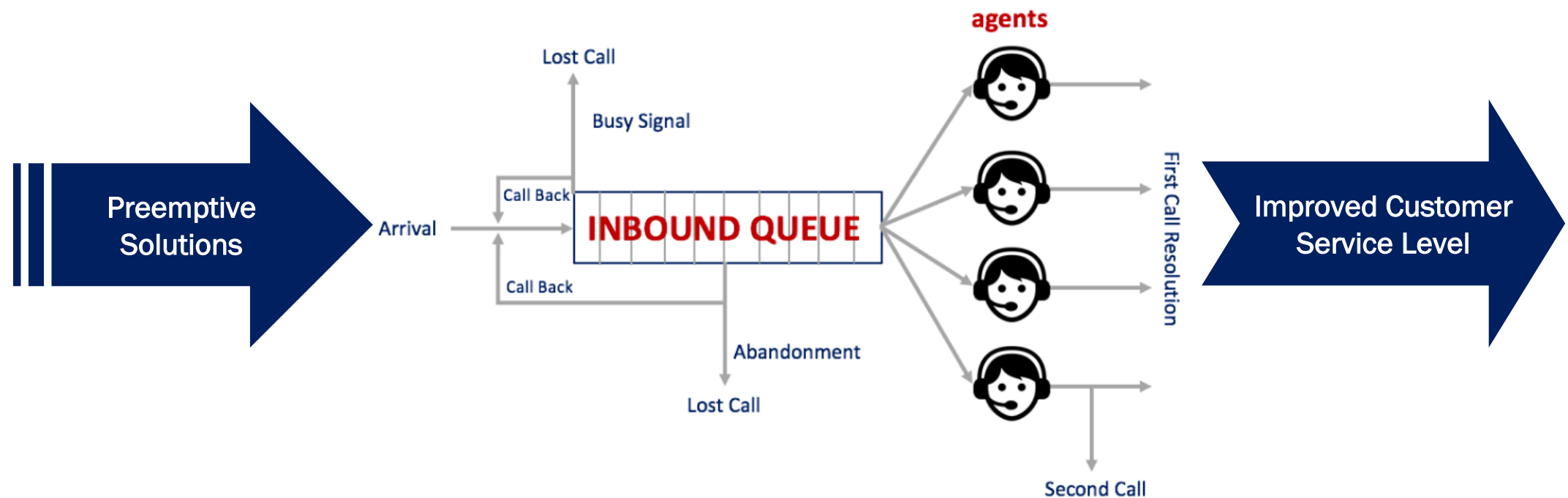
Agenda

- Problem Statement and Project Objectives
- Six-Step Methodology Summary
- Analysis Highlights
- Results and Important Insights
- Future Potential

A background image showing four call center agents (two men and two women) wearing headsets and working at computer monitors in a bright office setting. The image is faded to serve as a background for the text.

Problem Statement and Project Objectives

How can we preemptively reduce inbound customer calls and improve the customer service experience?

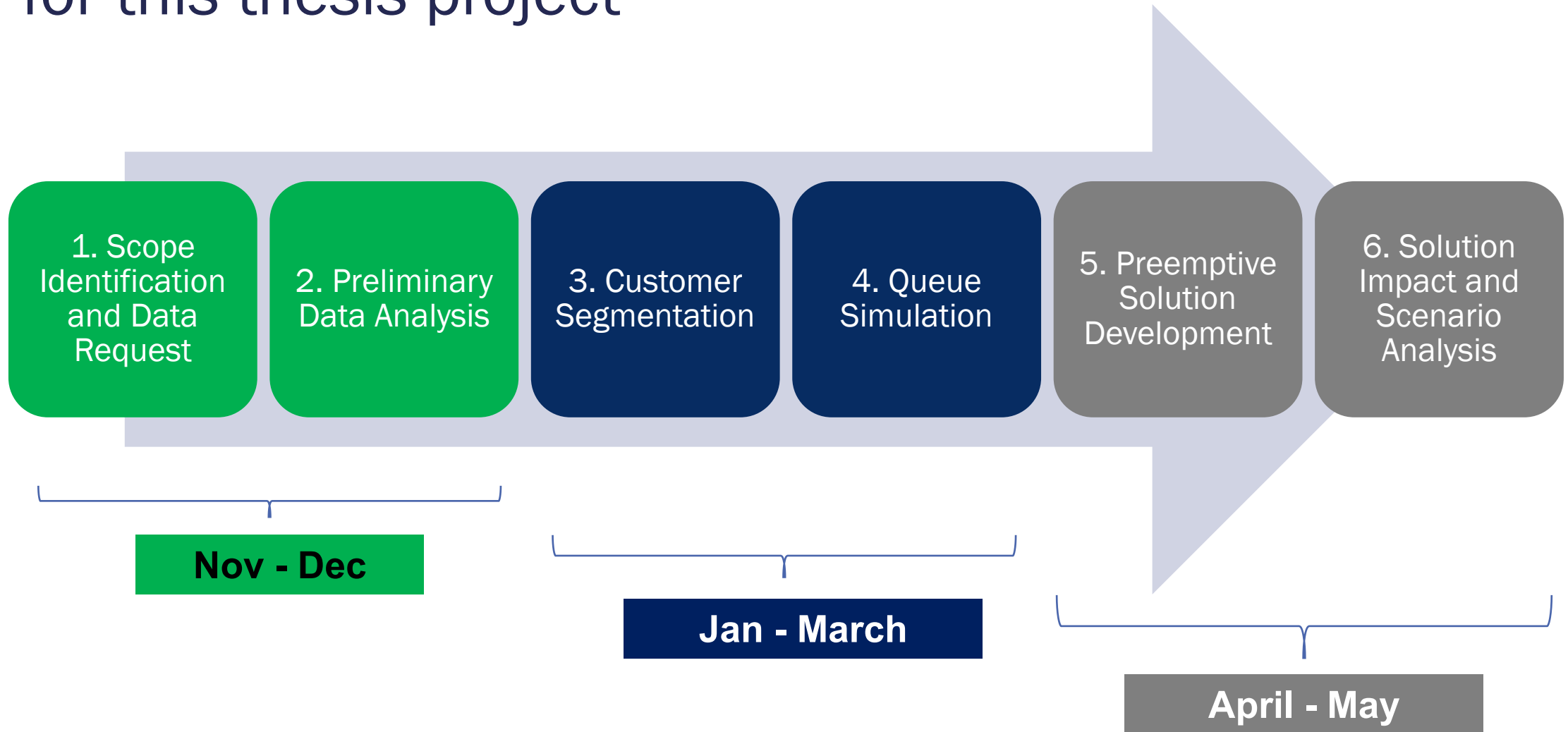


Note: Costs associated with any process improvement should not be a major constraint.

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Six-Step Methodology Summary

The team followed a 6-Step Project Methodology for this thesis project

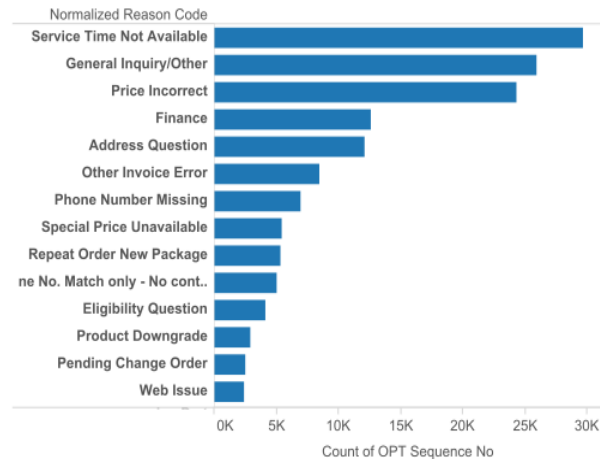


A photograph of four call center agents (two men and two women) sitting at their workstations in a bright office. They are all wearing headsets and looking at their computer monitors. The image is semi-transparent, serving as a background for the text.

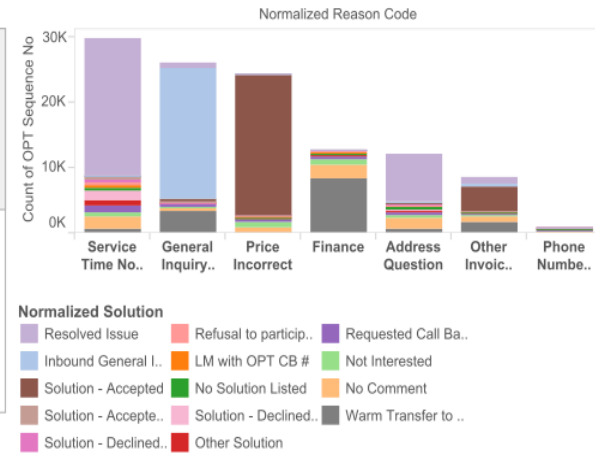
Analysis Highlights

Holistic Analysis on Inbound Customer Call Data (2015 Calendar Year)

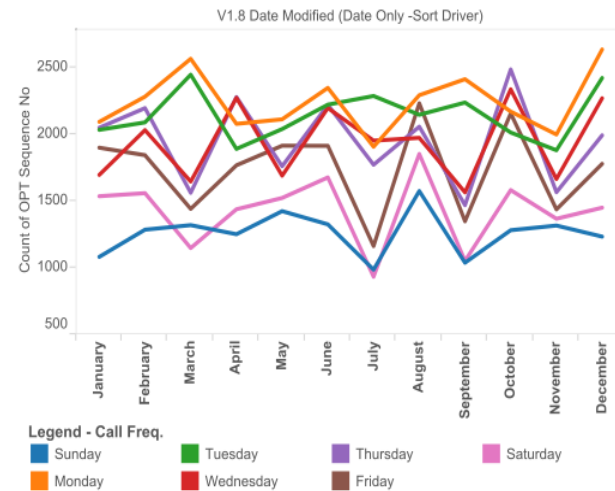
Reason Codes



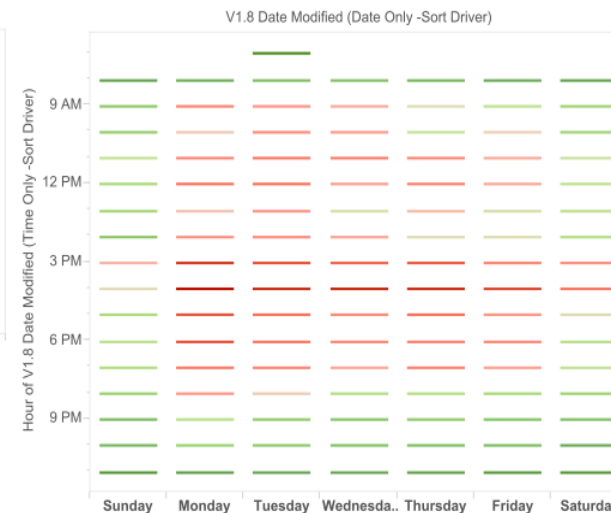
Reason and Solution Codes



Call Frequency by DOW



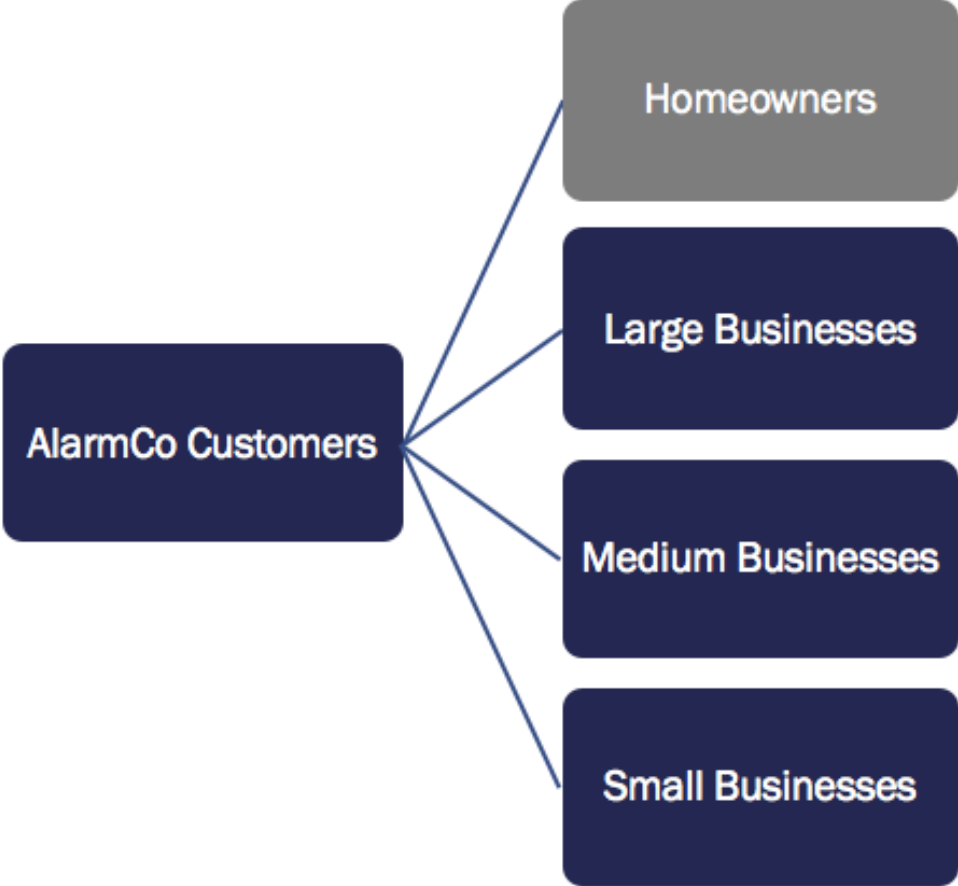
Daily Traffic



Key Findings & Questions

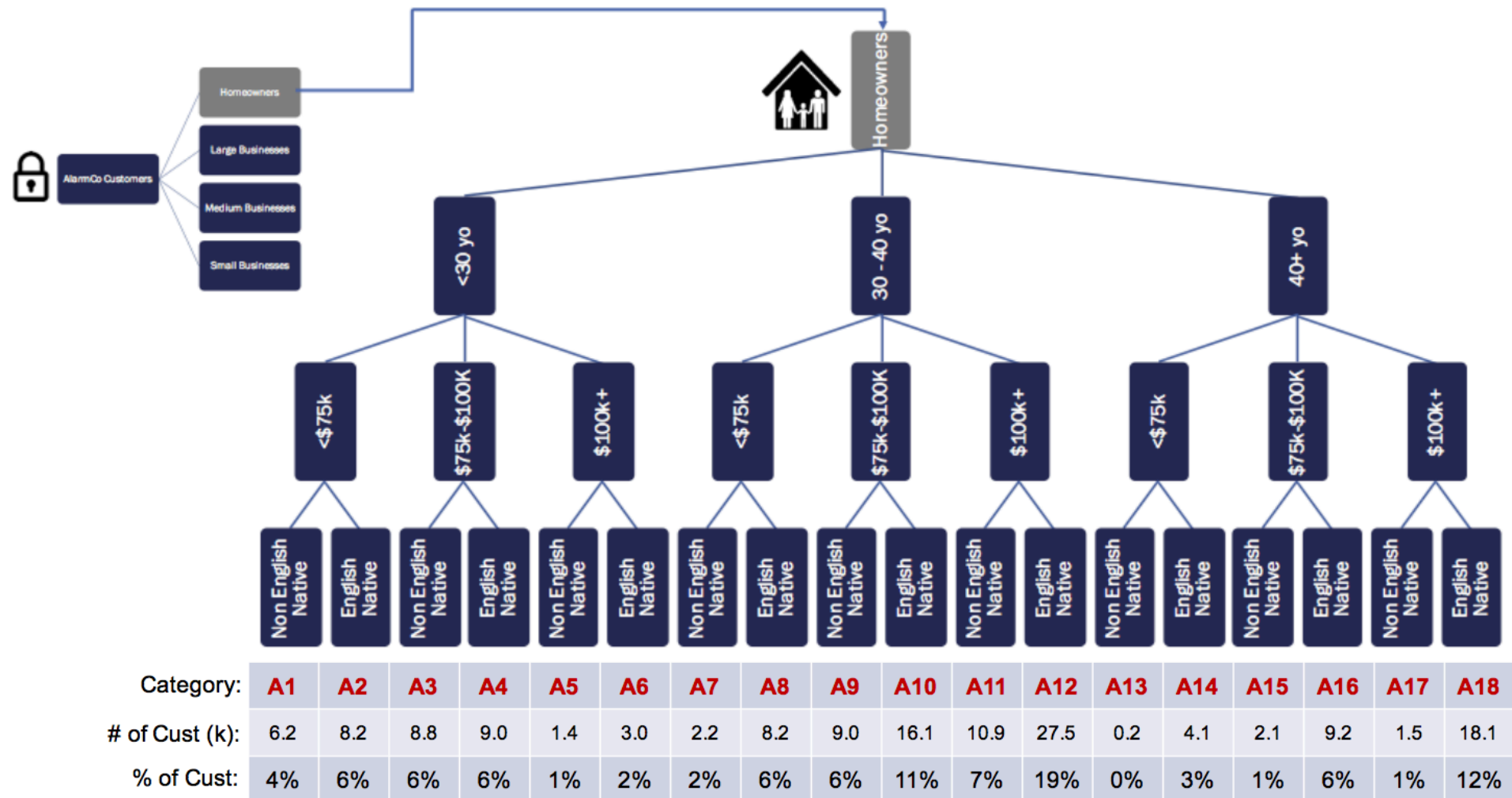
- Top **7 reason codes** account for 80% of calls
- All “other” reason codes attributed to general inquiries
- The key solution codes we will target include: **Resolved Issue and Inbound General Inquiries.**
- Dip/**fewer** in # of calls **in July**, Sunday has least inbound calls, Monday has highest count
- Highest inbound call traffic happens between **3:30 PM and 6 PM**

While AlarmCo has four major customer categories, the scope of this project includes only homeowners

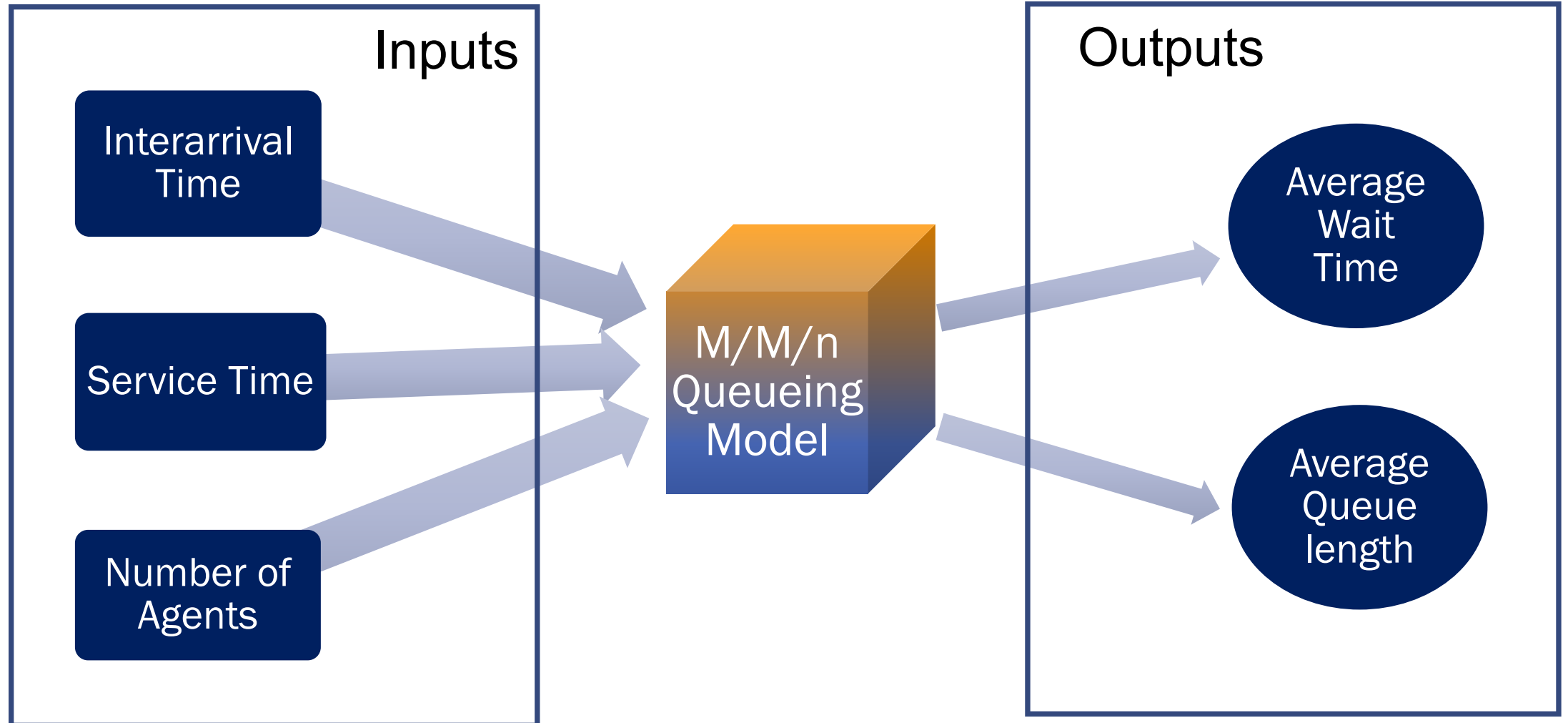


Segment	% of Sales	\$ Sales (M)	# of Customers
A	81%	\$700 - \$800	~5 M
B	2%	\$10 - \$20	~0.1 M
C	12%	\$75 - \$150	~0.7 M
D	5%	\$25 - \$50	~0.3 M

The team segmented customers into 18 sub segments based on sales, age, income and English proficiency




The team used the M/M/n queueing model to simulate the inbound traffic at the AlarmCo call center



20 preemptive solutions were proposed and 12 were selected based on their effectiveness and feasibility

#	Preemptive Category	Solution
1	Automated Remote Service	Proactive Upgrade
2	Automated Remote Service	Remote Device Reset
3	Automated Remote Service	Automatic Dispatch Parts/Components
4	Education	Send Brochure
5	Education	Video Tutorial
6	Education	Customer Call
7	Education	Email Tutorial
8	Education	Self-Install Kit
9	Online Resource	Frequently Asked Questions (FAQ)
10	Telephonic Assistance	Interactive Voice Response (IVR)
11	Proactive Analysis	Invest in SEO/SEM resources
12	Proactive Analysis	Additional Customer Service Metrics



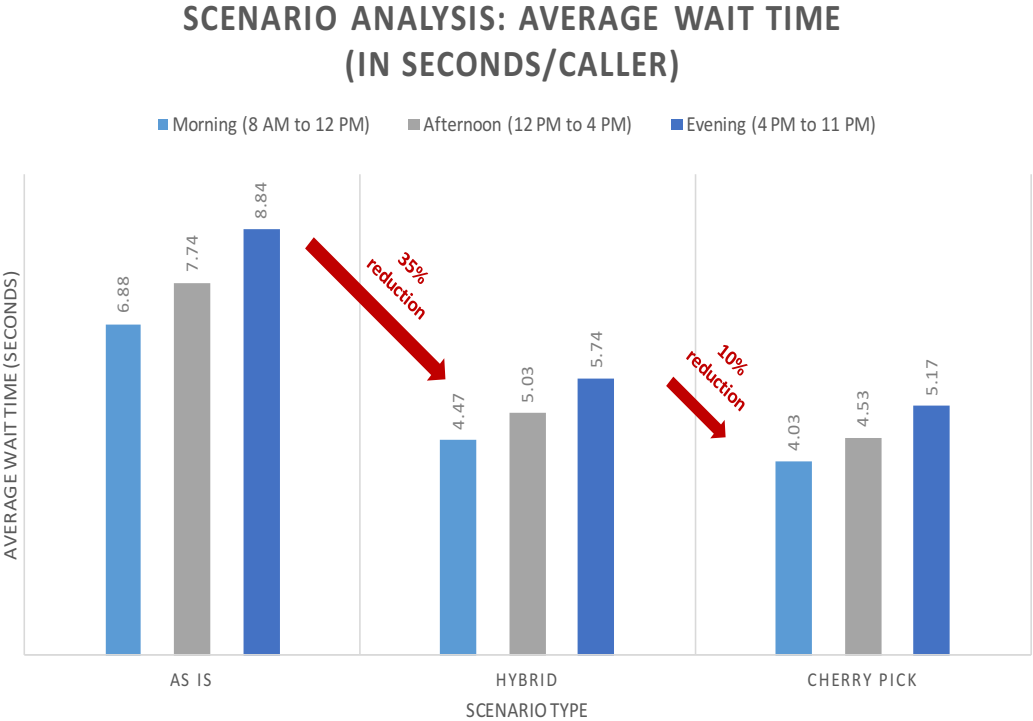
To ensure viability, the team used conservative approach for all estimation and took input from AlarmCo and OPT subject matter experts.

A background image showing four call center agents (two men and two women) wearing headsets and working at their desks with multiple computer monitors. The image is faded and serves as a backdrop for the text.

Results and Important Insights

The team tracked three key performance indicators supposing implementation of 12 preemptive solutions

- 6%** • Inbound Call Avoidance
- 35%** • Average Wait Time Avoidance
- 3%** • Agent Efficiency Decrease



Note: All calculation is based on the assumption that the number of agents is kept the same.

Queuing Insights and Special Considerations

1

- Poisson distribution is a robust model for a general queuing model

2

- Small changes in the number of inbound calls can have a large effect on the queue

3

- Tradeoffs have to be made between the service level and resources

The first category of preemptive solutions, Automated Remote Services, will be tracked by machine signal data

Alarm Signal to AlarmCo

		Alarm Signal to AlarmCo		
		Failure Signal	No Failure Signal	Grand Total
Alarm Performance	Actual Failure	130,088 (89.28%)	12,861 (8.83%)	142,949 (98.11%)
	No Failure	224 (0.15%)	2,536 (1.74%)	2,760 (1.89%)
	Grand Total	130,312 (89.43%)	15,397 (10.57%)	145,709 (100%)

Signal Failure

A photograph of four call center agents (two men and two women) sitting at their workstations in a bright office. They are all wearing headsets and looking at their computer monitors. The image is semi-transparent, serving as a background for the text.

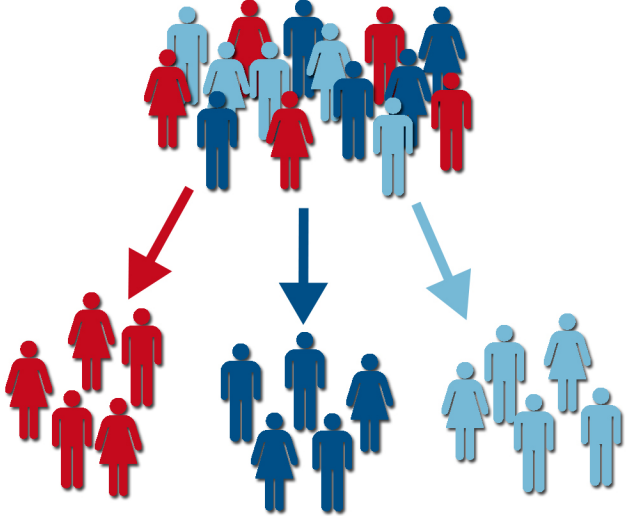
Future Potential

Like methodology can be applied to other companies in different industries

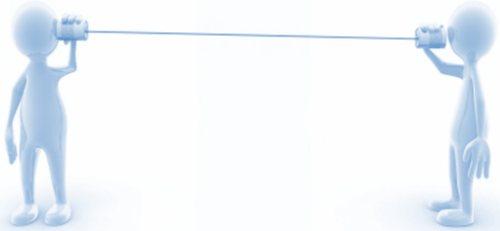
#	Methodology Steps	Consideration Specific to AlarmCo	General Consideration for Rolling Out
1	Scope Identification and Data Request	<ul style="list-style-type: none"> - Improvement in customer service was the main objective - Cost should not be a constraint 	<ul style="list-style-type: none"> - Define main objective and constraints of the company
2	Preliminary Data Analysis	<ul style="list-style-type: none"> - The unique identifiers were important for data analysis 	<ul style="list-style-type: none"> - Realize KPIs specific to the industry. i.e. seasonality, trends
3	Customer Segmentation	<ul style="list-style-type: none"> - Customer demographics data was important to the home security company 	<ul style="list-style-type: none"> - Consider factors to segment the customer group
4	Queue Simulation	<ul style="list-style-type: none"> - the M/M/n model was representative for the empirical queue data 	<ul style="list-style-type: none"> - Select queuing model which fits the empirical data
5	Preemptive Solution Development	<ul style="list-style-type: none"> - Preemptive solutions were finalized as a joint effort of both the research team and the industry professionals 	<ul style="list-style-type: none"> - Perform feasibility study through experienced groups in that industry
6	Solution Impact and Scenario Analysis	<ul style="list-style-type: none"> - Insights, risks, and future steps should be discussed with all stakeholders 	<ul style="list-style-type: none"> - Similar to the AlarmCo case

Note:
The home security industry is unique in terms of the critical need to resolve customer issues on first call.

AlarmCo Pilot Program in Three Steps



Customer Feedback



Choose neighborhood, finalize segment and narrow to three top preemptive solutions

Test automated remote services, education & proactive analysis

Customer feedback and compare with control group

A photograph of four call center employees (two men and two women) wearing headsets and working at computer monitors in a bright office setting. The image is overlaid with a semi-transparent white filter and dark blue L-shaped corner brackets in the top-left and bottom-right corners.

Thank You

A background image of four call center agents (two men and two women) wearing headsets and working at computers in a bright office setting. The image is semi-transparent and framed by dark blue L-shaped brackets in the top-left and bottom-right corners.

Appendix

Total Number of Inbound Calls Reduced per Year

	Daily Total Number of Calls		Daily Improvement Rate		Yearly Saving
	Before #	After #	#	(%)	#
Sunday	279.00	262.56	16.44	5.89%	855.03
Monday	496.00	465.75	30.25	6.10%	1572.75
Tuesday	474.00	445.55	28.45	6.00%	1479.18
Wednesd	428.00	401.35	26.65	6.23%	1385.83
Thursday	431.00	404.58	26.42	6.13%	1373.78
Friday	383.00	360.60	22.40	5.85%	1164.79
Saturday	310.00	291.58	18.42	5.94%	957.87
Total	2801.00	2631.98	169.02	[Avg] 6.03%	8789.23

Summary of the Reduction in Wait Time

	Daily Total Wait Time		Daily Improvement Rate		Yearly Saving
	Before	After (min)	(min)	(%)	(hr)
Sunday	41.59	29.01	12.58	30.24%	10.90
Monday	55.92	34.75	21.17	37.85%	18.34
Tuesday	68.67	43.33	25.35	36.91%	21.97
Wednesd	49.68	31.18	18.50	37.24%	16.03
Thursday	48.71	30.04	18.67	38.33%	16.18
Friday	49.40	32.31	17.09	34.59%	14.81
Saturday	39.92	27.02	12.90	32.31%	11.18
Total	353.90	227.65	126.25	[Avg] 35.67%	109.42

Figure 1. Call Center as a Queuing System

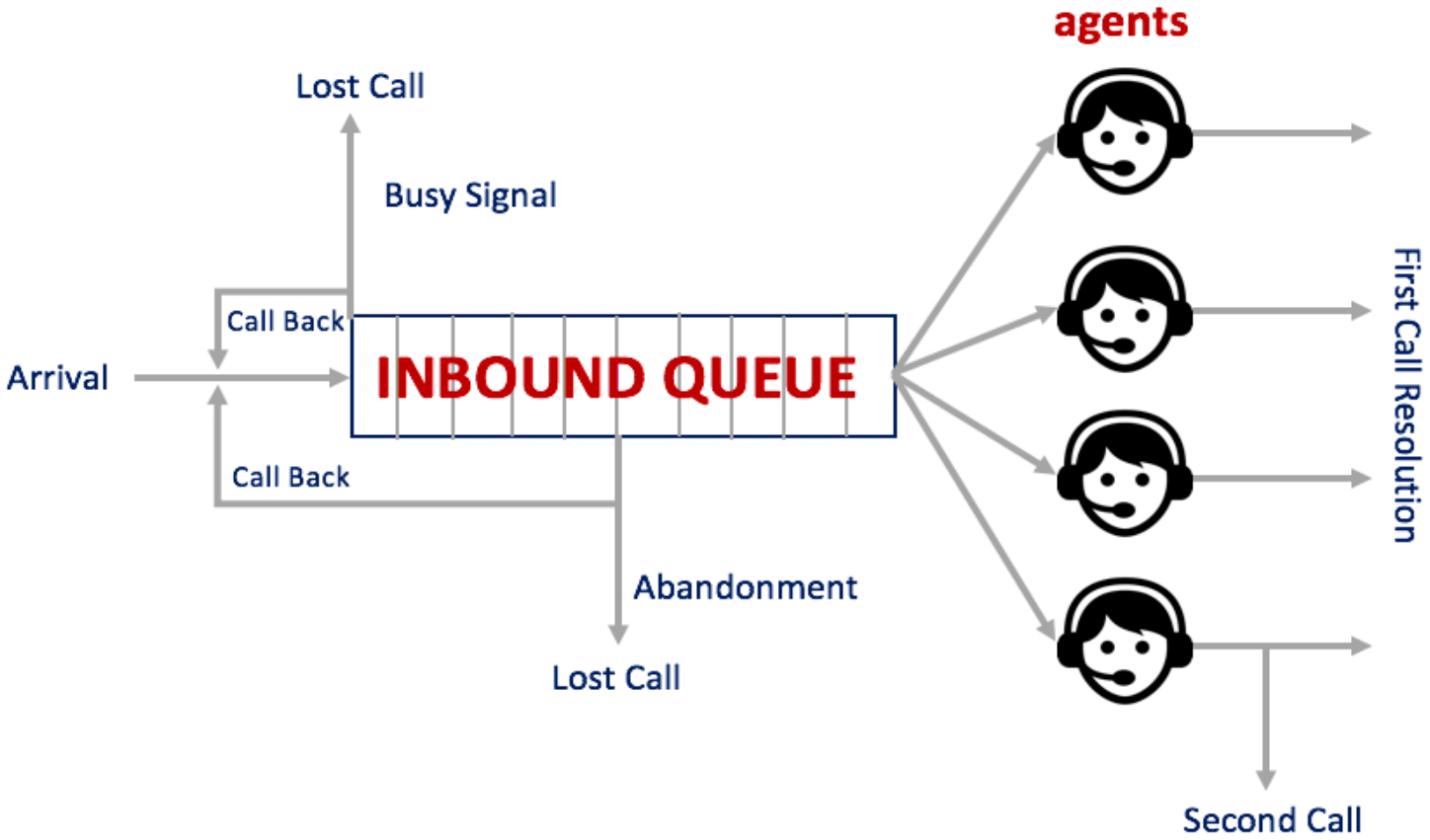


Figure 2. Holistic Six Step Project Methodology

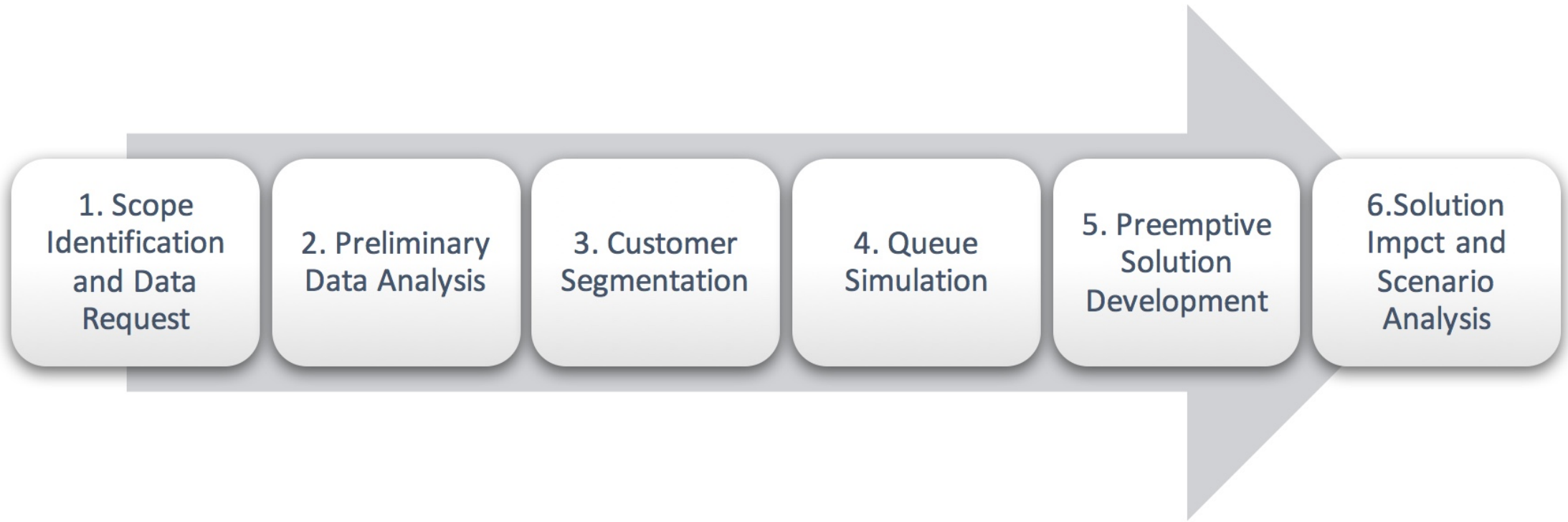


Figure 3. Customer Segmentation Process

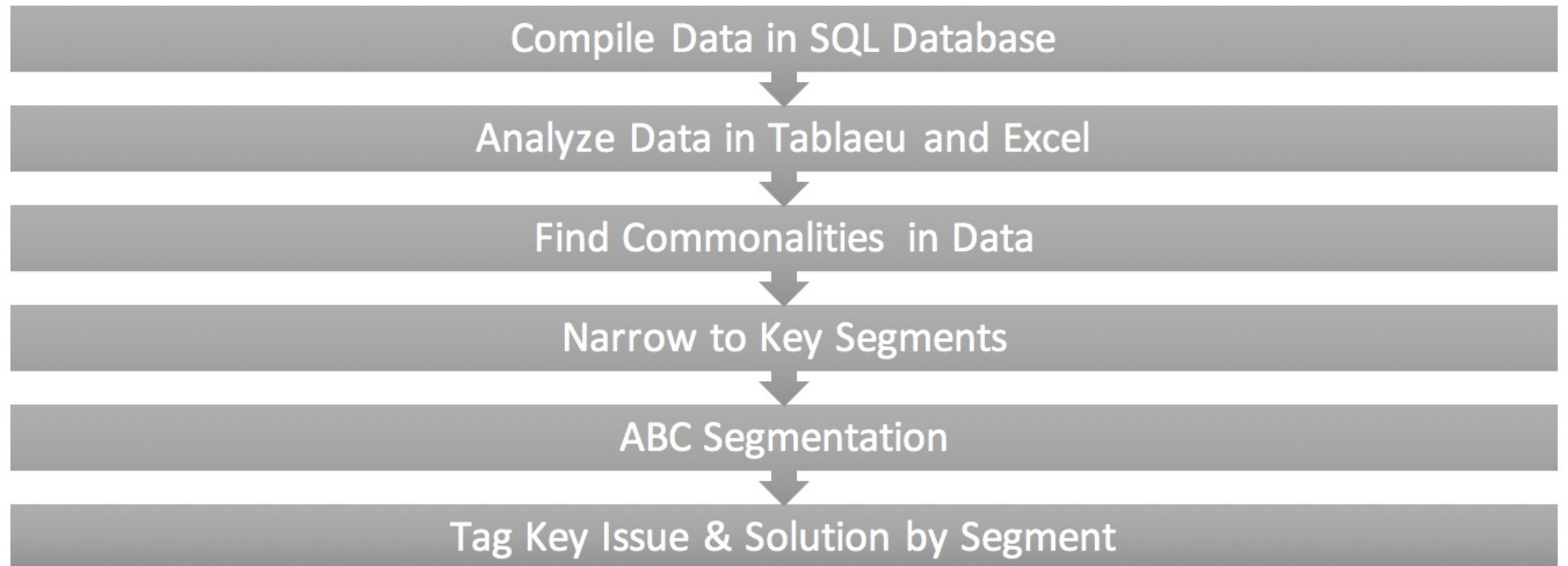
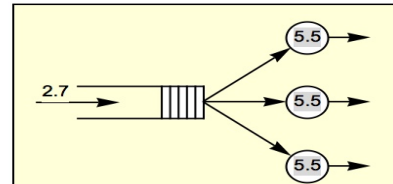


Figure 4. Sample Queue KPI Calculation in Mathematica

```
In[473]:= Q = QueueingProcess[2.70, 5.58, 3]  
QueueProperties[Q]
```

```
Out[473]= QueueingProcess[2.7, 5.58, 3, ∞, 0]
```



```
Out[474]=
```

Basic Properties	
QueueNotation	M/M/3
ArrivalRate	2.7
ServiceRate	5.58
UtilizationFactor	0.16129
Throughput	2.7
ServiceChannels	3
SystemCapacity	∞
InitialState	0
Performance Measures	
MeanSystemSize	0.486538
MeanSystemTime	0.180199
MeanQueueSize	0.00266676
MeanQueueTime	0.000987689

Figure 5. Percentage of Customer Calls by Reason Code

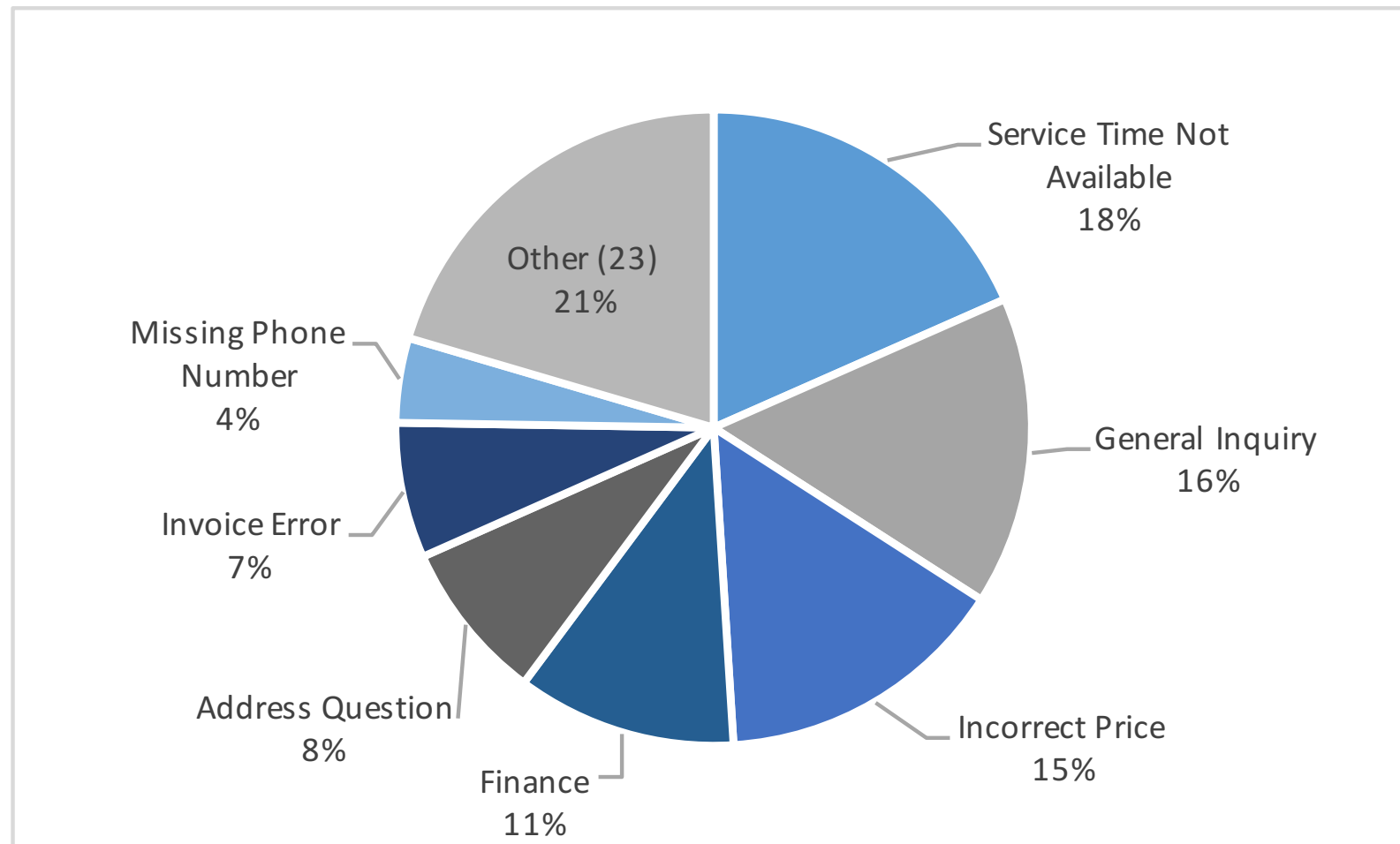


Figure 6. Solution Code Distribution by Top Reason Codes

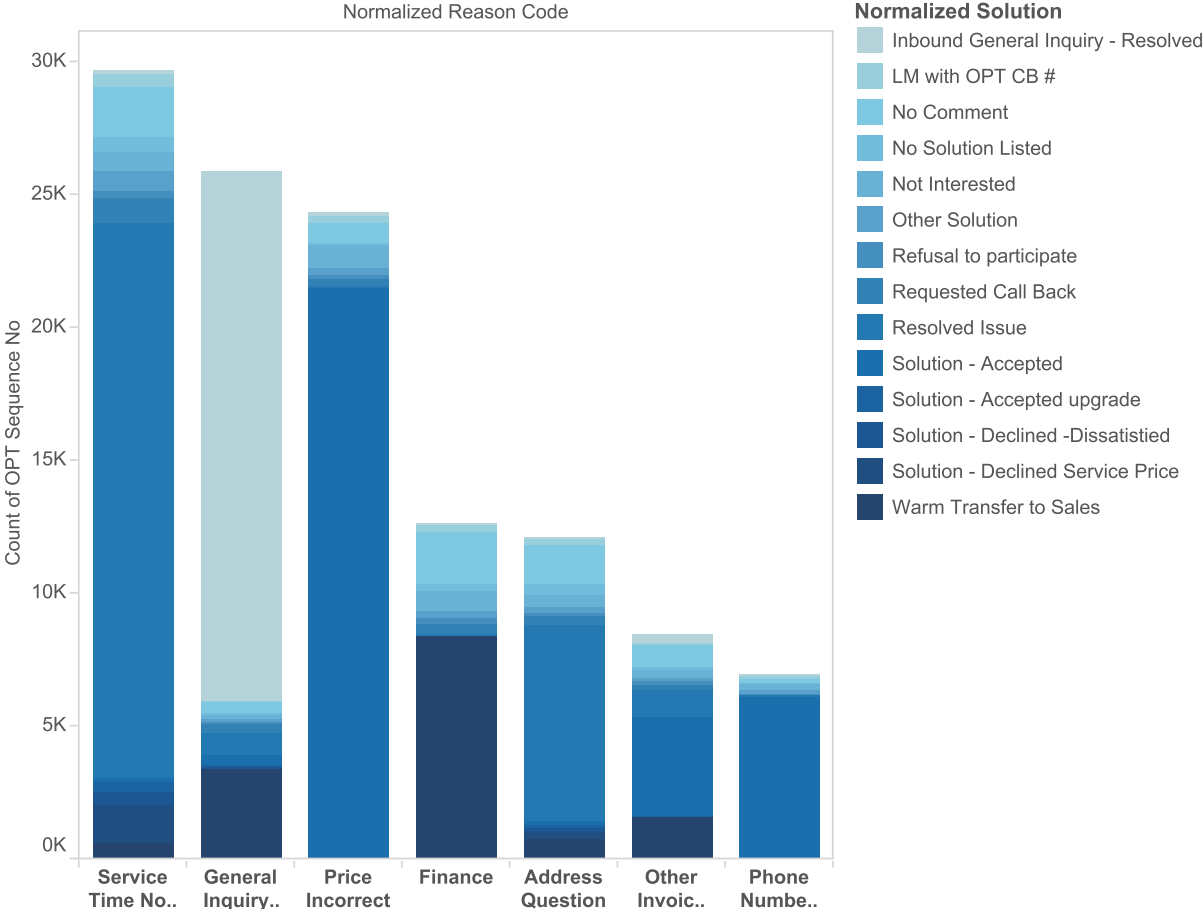


Figure 7. Call Frequency by Day of Week and Month

Call Frequency by DOW

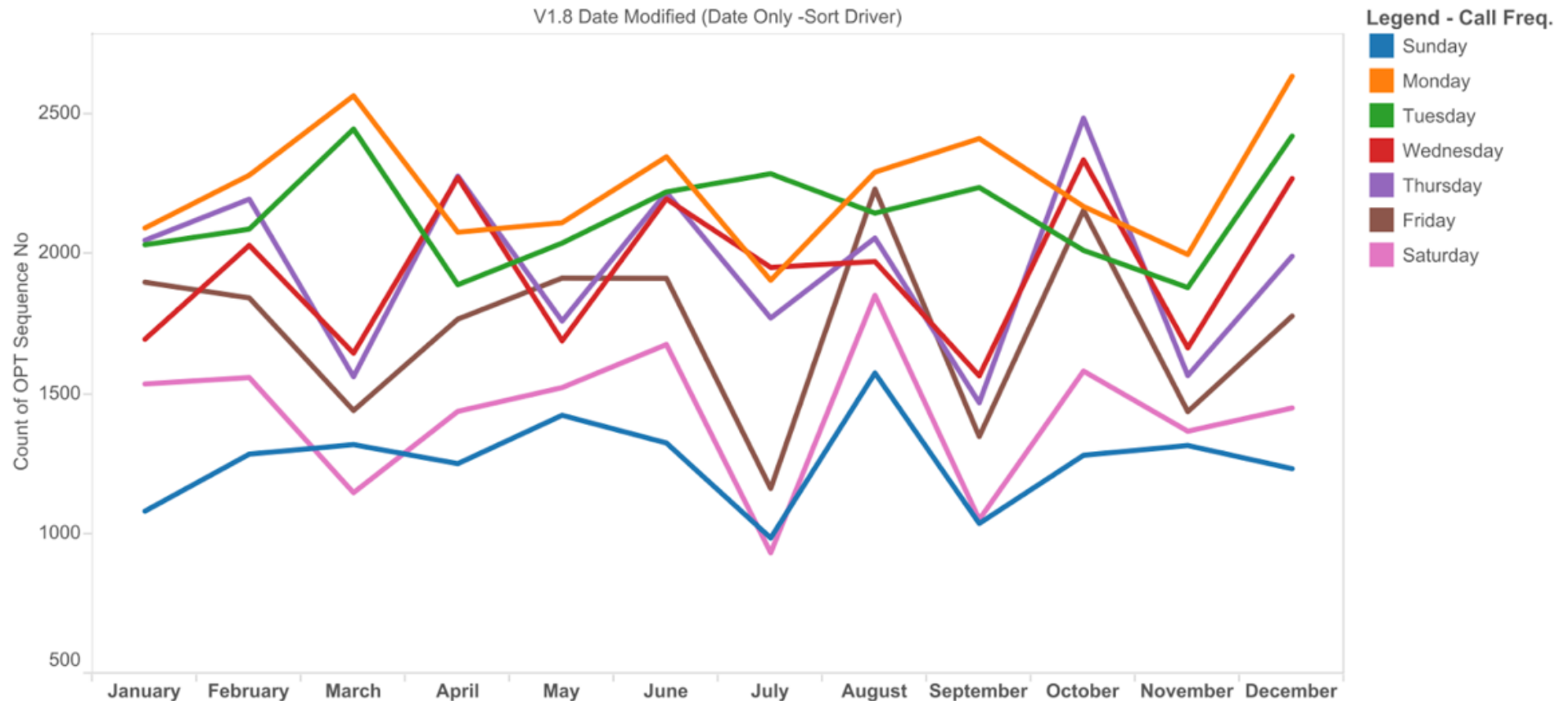


Figure 8. Box Plot of Call Frequency by Day of Week

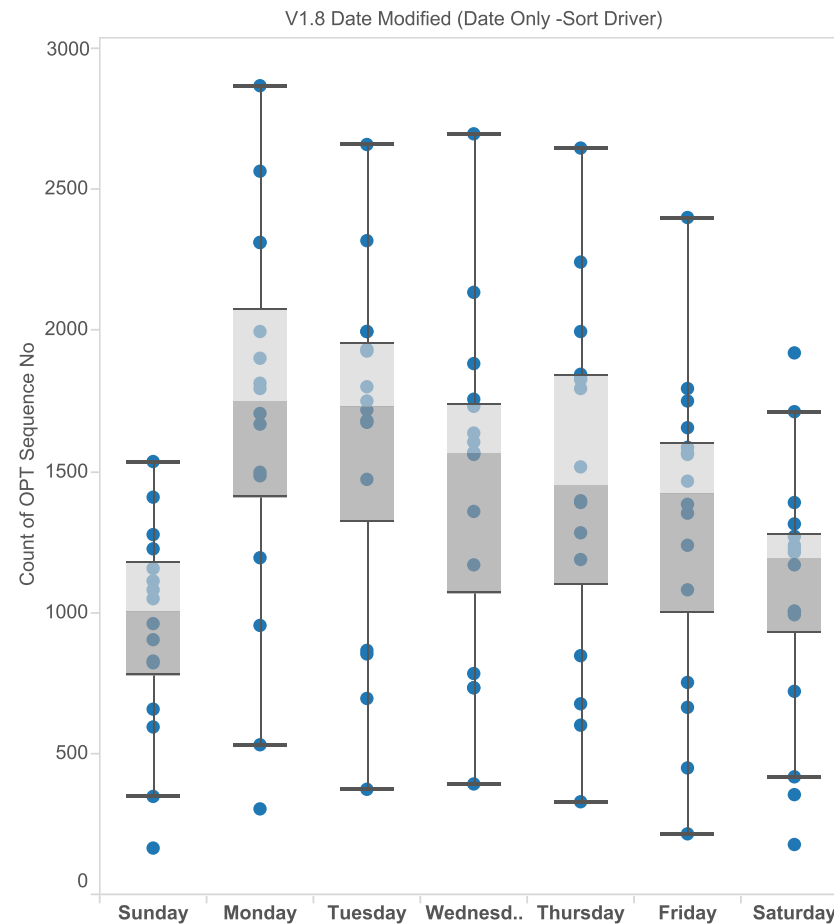


Figure 9. Call Time Distribution by Hour and Reason Code

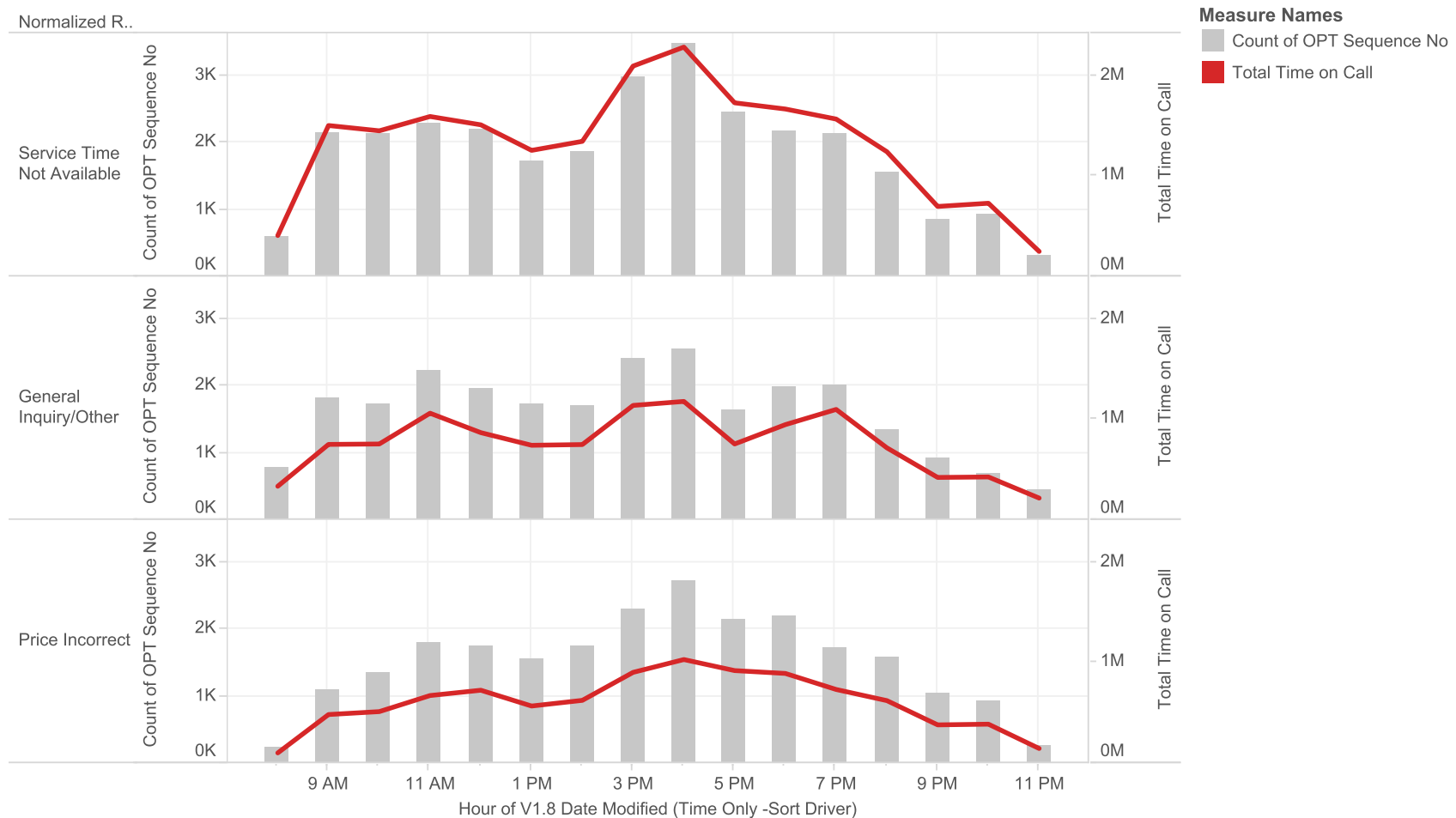
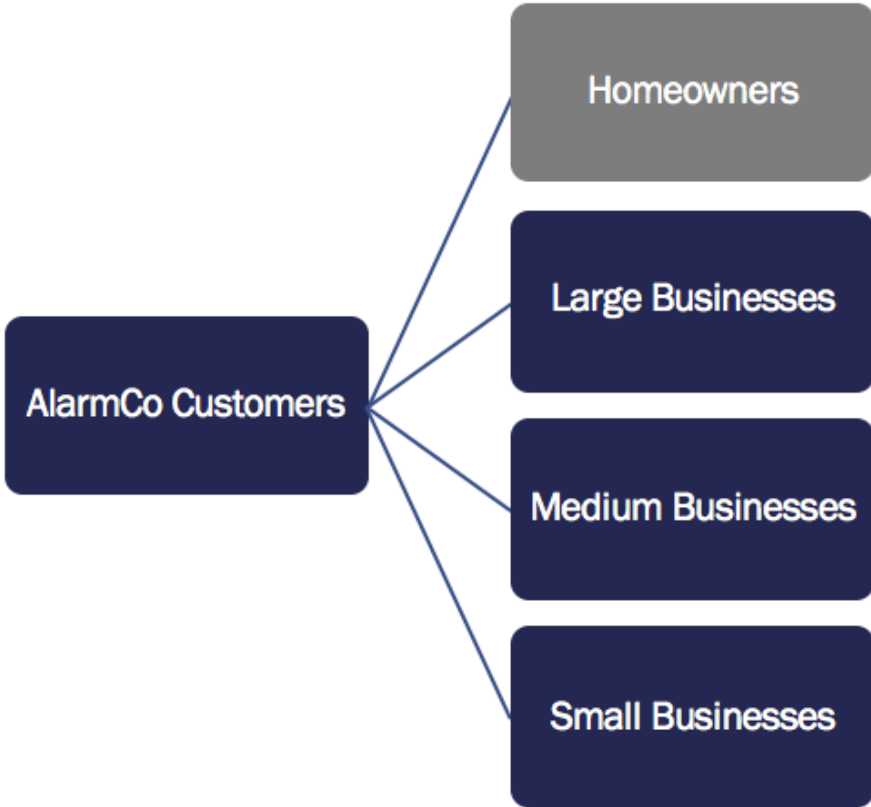
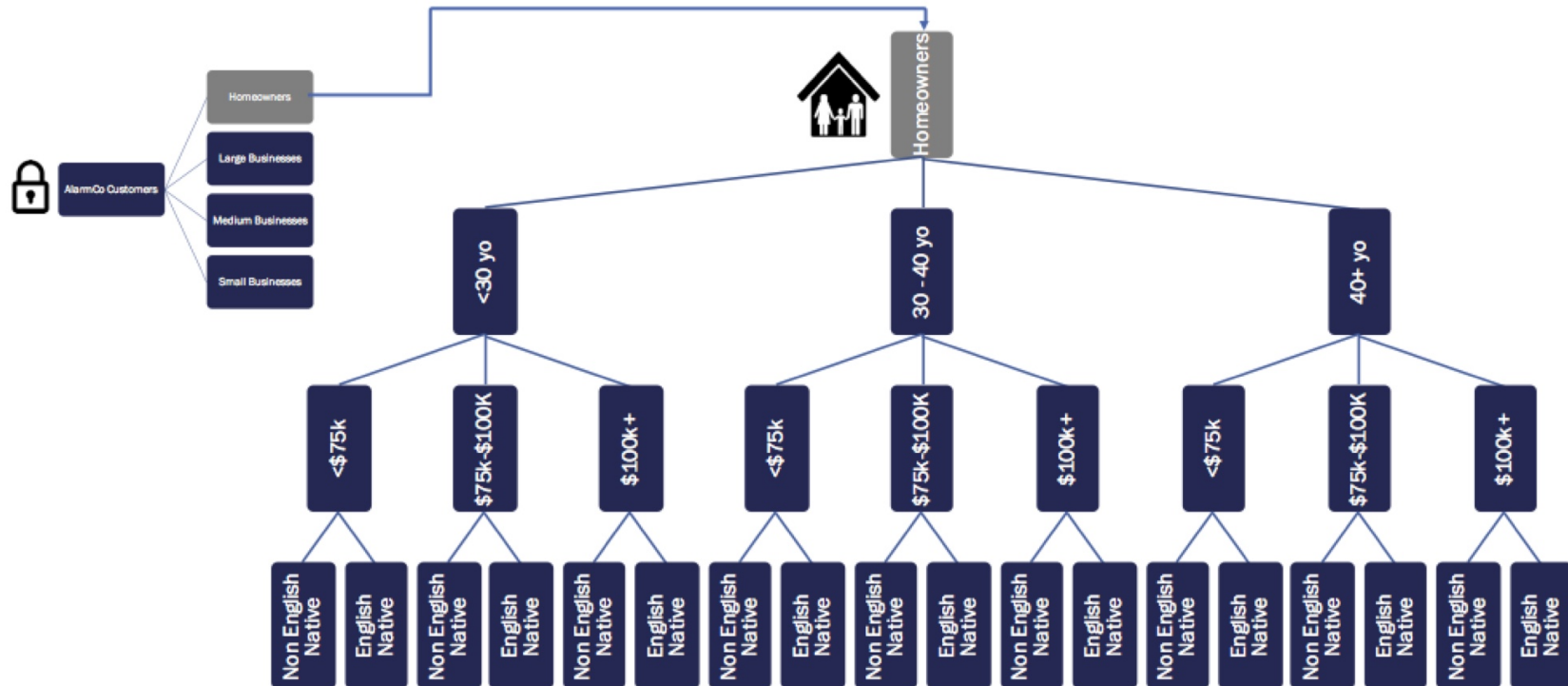


Figure 10. High Level Customer Segmentation



Segment	% of Sales	\$ Sales (M)	# of Customers
A	81%	\$700 - \$800	~5 M
B	2%	\$10 - \$20	~0.1 M
C	12%	\$75 - \$150	~0.7 M
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Figure 11. ABC Detailed Segmentation (Category A)



Category:	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18
# of Cust (k):	6.2	8.2	8.8	9.0	1.4	3.0	2.2	8.2	9.0	16.1	10.9	27.5	0.2	4.1	2.1	9.2	1.5	18.1
% of Cust:	4%	6%	6%	6%	1%	2%	2%	6%	6%	11%	7%	19%	0%	3%	1%	6%	1%	12%

Figure 12. Sample Segmentation for Issue: General Inquiry (GI), Solution: GI Resolved

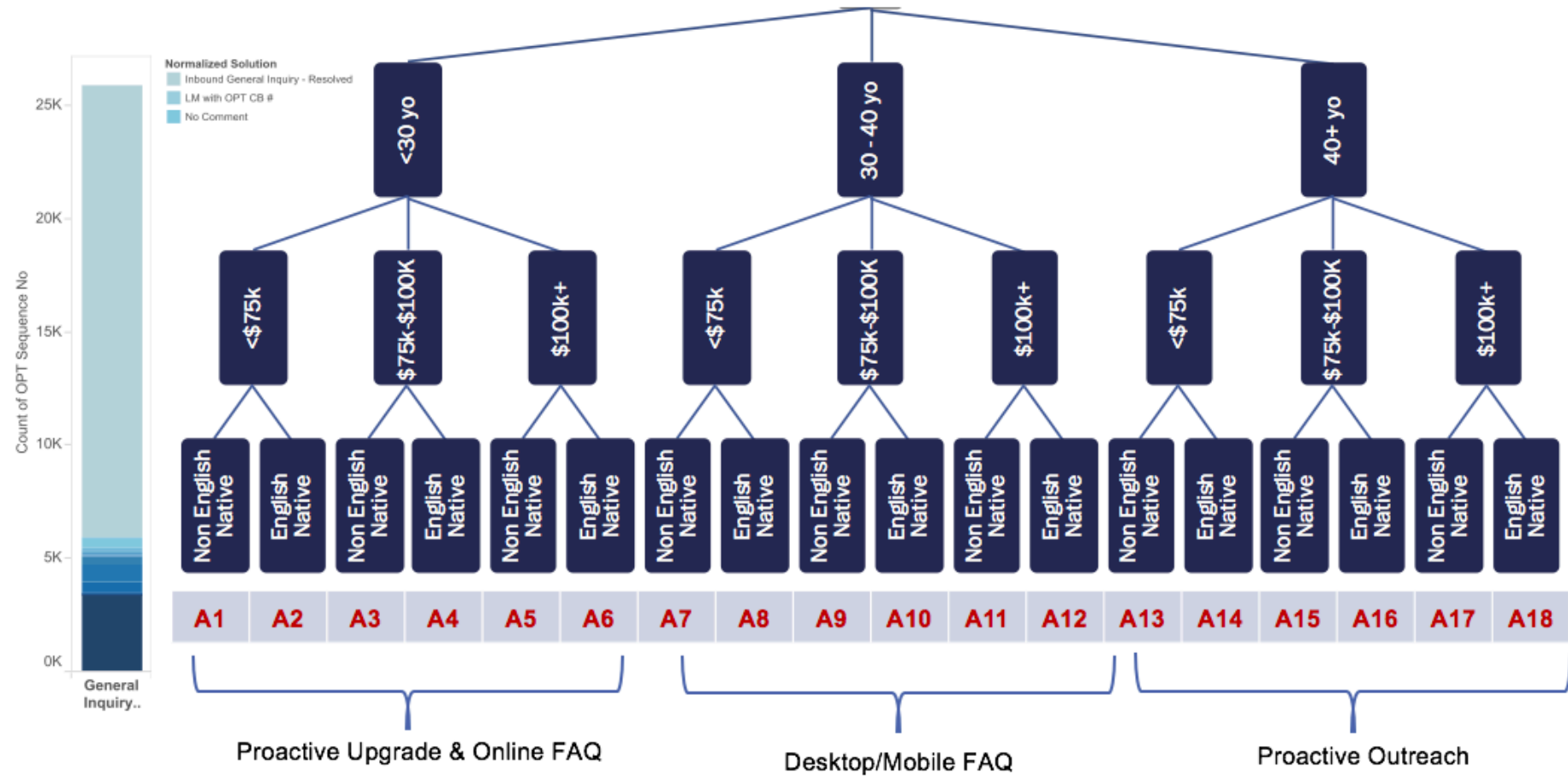


Figure 13. Scenario Analysis of Wait Time Reduction

SCENARIO ANALYSIS: AVERAGE WAIT TIME
(IN SECONDS/CALLER)

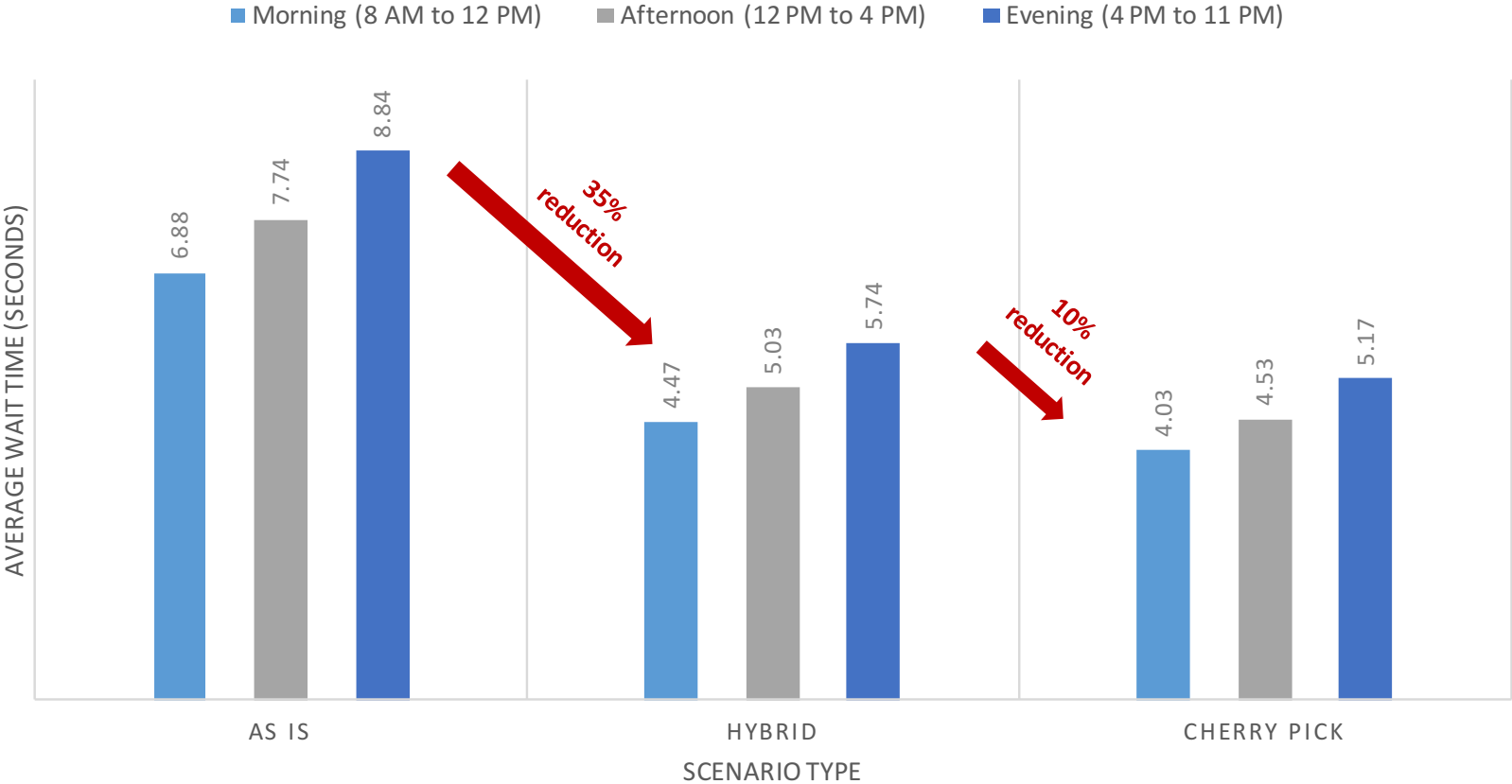


Figure 14. Frequency of Interarrival Time

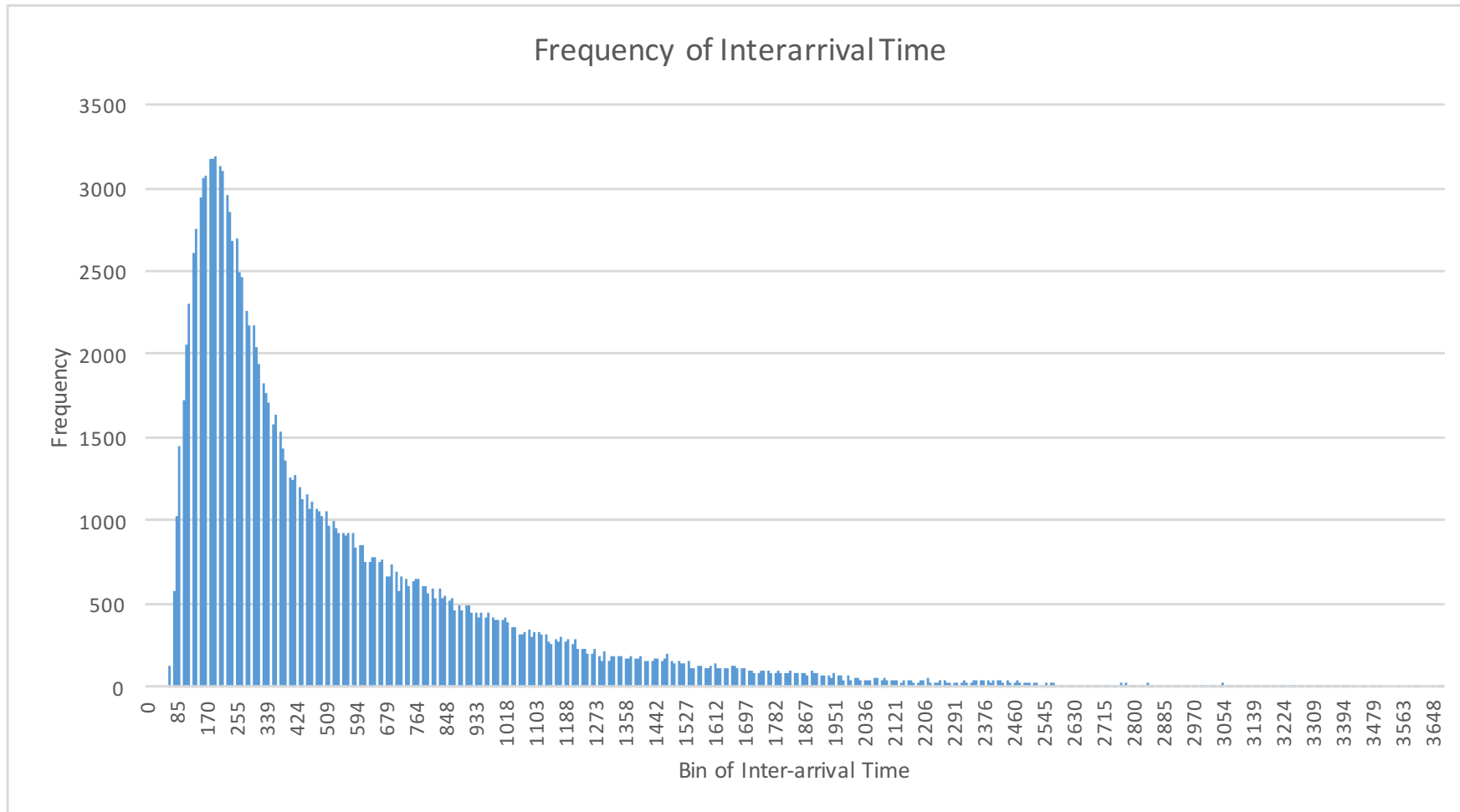


Figure 15. Frequency of Service Time

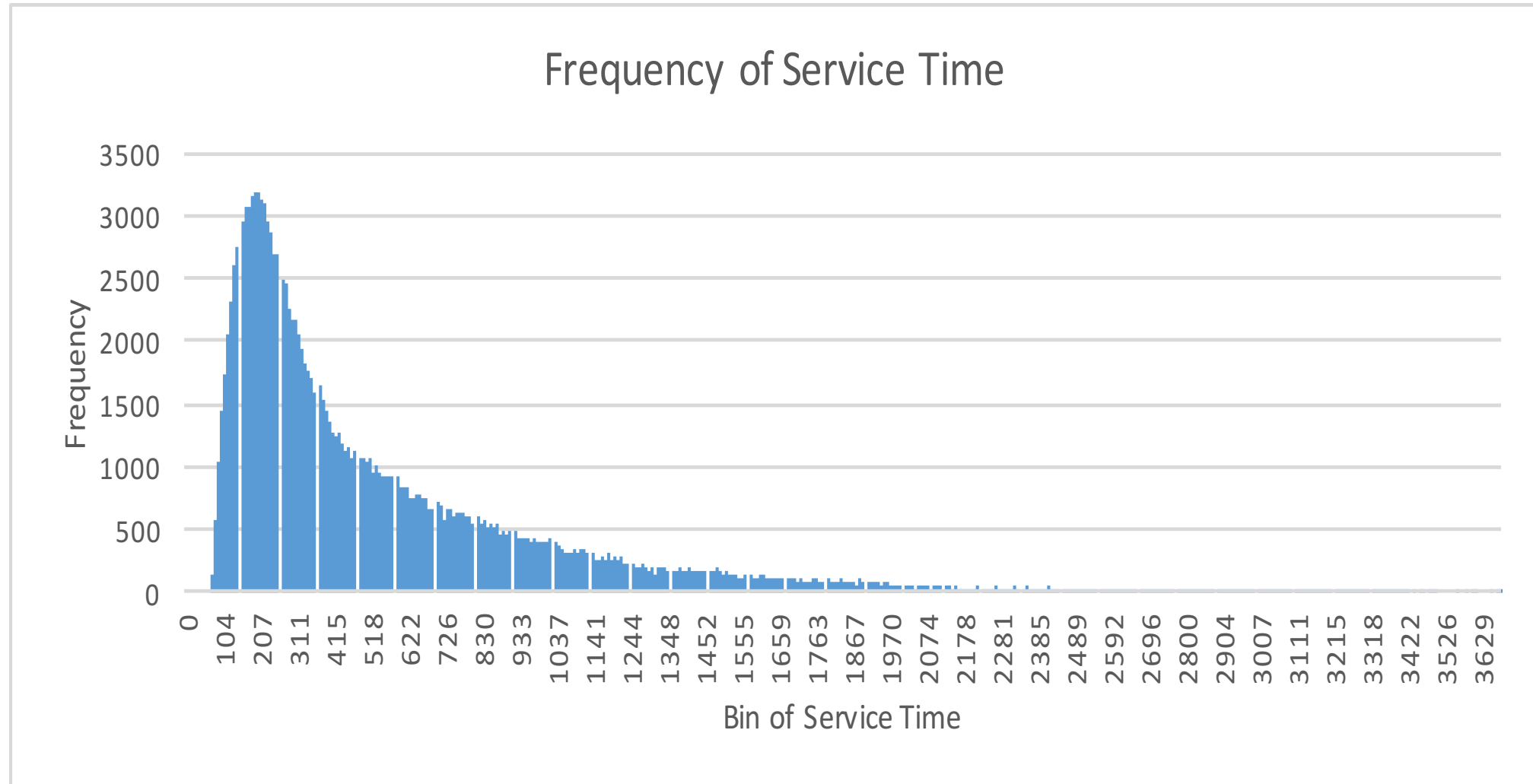


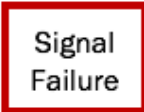


Figure 16. Machine Failure Prevalence


Alarm Signal to AlarmCo

		Failure Signal	No Failure Signal	Grand Total
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 Signal Failure