Enhancing the Customer Service Experience in Call Centers Using Preemptive Solutions and Queuing Theory

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Topic Areas: Queuing Theory in Call Centers, Simulation, Segmentation, Home Security Industry

Summary: The security alarms services market in the United States delivers hardware equipment and services to homeowners and businesses to help monitor and enhance personal property protection. For this thesis, MIT partnered with OnProcess Technology, a managed services provider specializing in complex, global service supply chain operations. Together, the team developed a robust framework to preemptively reduce the number of inbound customer calls, and thereby improve customer service. The team followed a three-step process to develop this framework: customer segmentation, call center queue simulation (using interarrival times, service times, and number of agents), and preemptive solution development.

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KEY INSIGHTS

1. Security companies fail to utilize preemptive solutions when managing inbound customer calls and default to reactive measures, which unnecessarily increase wait times and queue lengths.
2. Customer segmentation can create targeted solutions for prominent customers, based on call volume, reason for call, and sales.
3. A small percentage of call avoidance can have a large impact on queuing performance indicators such as queue length, wait time, and overall customer satisfaction.

Introduction

The security alarms service market has seen significant growth in the last twenty years with the growing prevalence of cybersecurity and remote monitoring as well as a rapidly growing middle class segment of the US population. In fact, the home alarm securities and automation market is expected to triple by 2018. Many security alarm services companies have not realized the promise of waves of new technologies that are creating breakthroughs in the sector of inbound service queue management. Some of these major developments include the transition from voice based service to automated web services and the transition from live phone call issue resolutions to intelligent voice recognition.

Players in the security service market try to maximize customer satisfaction by creating highly efficient and high performing call centers. Typical benchmarks used to assess this performance include service level, average speed to answer, call duration, first call resolution rate and abandoned rate. Agents track these variables in dashboards that are highly advanced and have innovative reporting mechanisms including weekly metrics reports, labor attrition reports, schedule adherence reports, agent ranking reports, and call resolution reports.

For the purposes of this thesis, we have teamed up with OnProcess Technology (OPT) to provide a planning framework that utilizes these breakthroughs to allow our client company, AlarmCo, a major security service provider, to shift from inbound service queues to preemptive next issue avoidance using queuing theory and predictive analytics. Developing preemptive measures in place of reactive solutions could cut queue length, reduce average wait times, and free up agent capacity.

To understand the current call center system, the MIT thesis team simulated the queue of an AlarmCo call center by calculating interarrival rates, service time, and using the number of agents by hour and day of week. The call center as a queuing system can be mapped as per Figure 1.

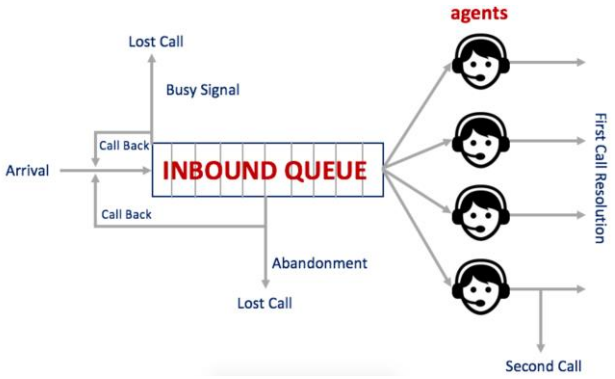

Figure 1. Call Center as a Queuing System

The team also strategically segmented the AlarmCo customer base and developed targeted preemptive solutions for prevalent segments. After adjusting the queuing inputs per the potential preemptive solutions, we were able to directly assess the quantifiable impact of introducing preemptive solutions to this industry.

Analysis, Methodology, and Insights

Analysis

The team first requested three separate sets of data including details on inbound customer calls, customer demographics and labor resource plans. We then performed preliminary data analysis to understand the top customer reason codes and solutions for the inbound traffic. Analysis of call volume reveals that 80% of calls are made by customers with seven of the thirty possible issue codes. Taking a closer look at these top issue codes, we found that a majority of calls were warm transfers to sales (agent transfers call, without concrete solution), solutions that were accepted by the customer, and resolved solutions to general questions. The call data also revealed that Sunday, Saturday, and Friday had the lowest call volumes while the days with the largest number of incoming calls were Monday, Tuesday and Wednesday. Additionally, we noticed a dip in total call density in the months of December and July. When studying the distribution of calls, we learned that the highest call count on any Sunday for the calendar year was 1500, nearly 40% lower than the maximum number of inbound calls on Monday.

Customer Segmentation

Next, customers were segmented by demographic groups and prevalence of top reason codes (Figure 2). Demographic data helped us group AlarmCo customers into two categories: business clients and homeowner clients. Homeowners account for 81% of sales while the business clients account for the remaining 19%. The homeowner category can be further broken down to platinum or premium customers accounting for 15% of customers, silver customers (average package holders) accounting for 58% of customers and finally, basic package holders, accounting for the remaining 27%. The team segmented the homeowner customers into 18 sub groups based on their age, income, and English proficiency level.

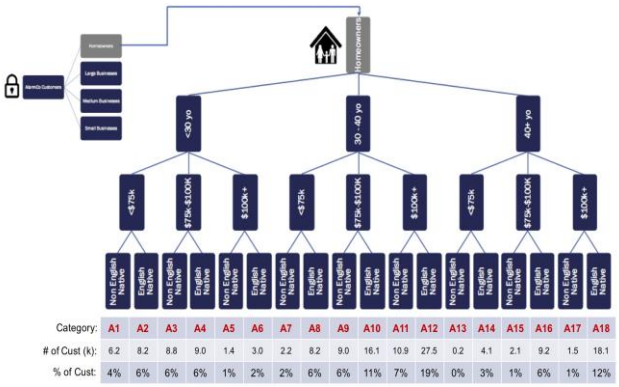

Figure 2. ABC Detailed Segmentation (Category A)

Queuing Simulation

The team selected the appropriate queuing model based on the inbound call center data and decided to approximate the interarrival rate and service rate as a Poisson distribution. In order to make sure the selected model, M/M/n, was representative of the call center, the team extracted empirical inputs (interarrival rate, service rate, and the number of agents) and outputs (average wait time and average queue length) from the customer queue data, and compared the theoretical outputs with the empirical data. Since the difference fell within a 10% validity threshold, it could be concluded that the M/M/n model accurately emulates AlarmCo's inbound customer call queue.

Preemptive Solutions

Customer segmentation led to the development of different preemptive solutions addressing major call reasons codes. We developed 20 solutions that fell into five categories:

- Automated Remote Services
- Education
- Online Resources
- Telephonic Assistance

- Proactive Analysis

We calculated the impact of the recommended preemptive solutions on the number of inbound calls using a feasibility and risk ranking.

Comparative Analysis

After calculating different success rates for each of the twenty preemptive solutions, we applied a weighted average percent reduction of interarrival rate for each day and hour. With these new and improved interarrival rates, the team was able to rerun the queuing simulation and compare three different scenarios: implementing no preemptive solutions (as-is state), implementing the most favorable (twelve) preemptive solutions, and finally, implementing all twenty solutions (cherry pick). After updating the queuing model interarrival rates, we see that wait times steadily decrease with implementation of each scenario. If AlarmCo conservatively moves forward with twelve of the twenty solutions, average wait times reduce from 6.88 seconds to 4.47 seconds in the morning, 7.74 seconds to 5.03 seconds in the afternoon, and 8.84 seconds to 5.74 seconds in the evening. If the client implements all twenty solutions per the cherry pick scenario (best case), average wait times reduce from 6.88 seconds to 4.03 seconds in the morning, 7.74 seconds to 4.53 seconds in the afternoon, and 8.84 seconds to 5.17 seconds in the evening (Figure 3).

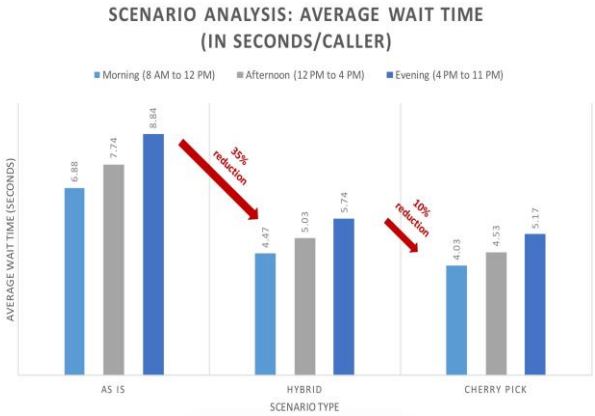

Figure 3. Scenario Analysis of Wait Time Reduction

Conclusion

Three major insights can be drawn from the process of applying queuing theory in this research:

- Poisson distribution is a robust model for a general queuing model
- Small changes in the number of inbound calls can have a large effect on the queue
- Tradeoffs have to be made between the service level and resources

While the home security industry in the United States has seen vast change in the last decade in terms of technological innovation, security companies are still not able to fully utilize call center data to develop proactive solutions in place of reactive measures. In closing this gap, the team addressed the following question for AlarmCo: “How can we improve the customer service experience for customers of a major security service provider in the US?”

By analyzing the outputs of the simulation before and after adjusting the dataset, the team quantified the impact of preemptive solutions on the call center queue. Ultimately, narrowing to twelve strategic preemptive solutions led to the enhancement of the as-is queuing model, reducing average wait time by up to ~35%. Our chosen hybrid model is a conservative and feasible approach in implementing preemptive solutions with the goal of minimizing inbound calls and reducing average wait time. The twelve solutions, scattered across all five preemptive solution categories, have strong support from stakeholders and according to our research, will work successfully with other similar players in the home alarm securities market.