

Sam's Club Tire and Battery

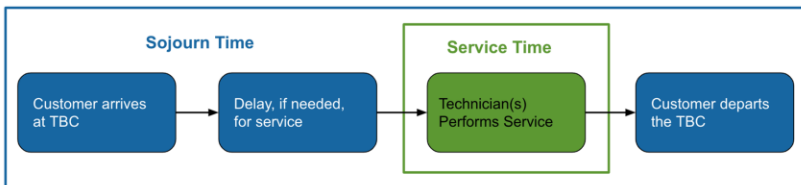
Sam's Club is a subsidiary of Walmart that generates \$80 billion annually with its membership-based business model. Sam's Club offers grocery, retail, pharmacy, and tire and battery centers to their members.



Our system of interest is the Tire and Battery Center department. It offers tire services, battery exchange, headlight restoration, and windshield wiper replacement. There are also a couple sub-services including rotate and balance and fix a flat.

Customer Sojourn Time

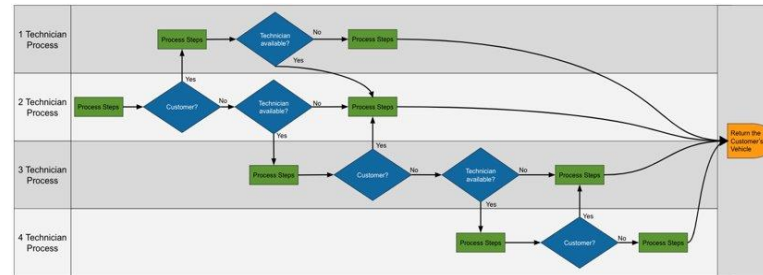
Sam's Club is primarily concerned with customer sojourn time and inconsistencies of the service process across locations. Our goal was to analyze service times and technician utilization to provide a standardized method for when multiple technicians are servicing a vehicle.



Sojourn time is the time between a customer initially speaking to a technician and the time that they leave with their vehicle. Service time is only the time it takes for technicians to complete the service(s). This distinction is important because we are considering them to be two different metrics. For this project, we are primarily concerned with service time. Sam's Club would prefer for service time per vehicle to be an hour or less. We would like to find an optimal number of technicians to service a vehicle to reduce service time without a significant reduction in utilization.

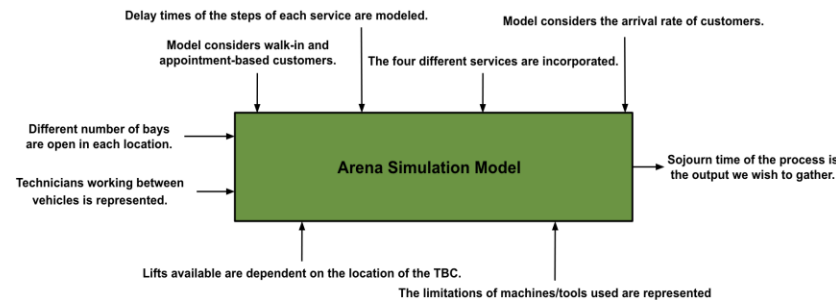
Simulation of Service Process

We built a simulation model to analyze overall sojourn time with different configurations of available bays and technicians to participate in the service process. Our model allows technicians to float between services to more accurately represent what is currently happening in Tire and Battery Centers. After we built the floating model, we extracted pieces of our model to explore how sojourn time varied depending on the maximum number of technicians allowed to participate on each service. We completed this for a maximum of 2, 3, and 4 technicians, respectively.



Aspects of our Simulation Model

Our simulation model can control the number of technicians in a system, the number of bays available for use. The model considers different types of customers and their arrival rates. The model can report service time, sojourn time, and resource utilization. We developed simulation models to represent any number of technicians working on a vehicle at a time. This allowed for comparison between technicians, allowing us to compare service times and technician utilizations.



Data Collection

We observed TBC operations for ten hours across three locations to enable modeling of several of the simulation inputs. This gave us a deeper understanding of the steps in the processes as well as the precedence requirements to inform our model. It also allowed us to verify the aspects of our model when we changed the number of technicians working on a car at any point in time. We were also able to provide Sam's Club with this data for further use regarding the scheduling of customer appointments.

Process Step	Work Element	Who's performing the service?					Start Time	Duration	End Time
		Tech 1 (Lead Tech)	Tech 2	Tech 3	Tech 4	New Hire?			
Pre-inspection	Look for damages to the wheels or vehicle								
	Drive car into bay								
Pull new tires from storage racks	Look at what tires were ordered								
	Go to storage racks								
	Grab tires								
	Bring tires back to car								
Carefully raise the vehicle	Grab guidebook								
	Determine the lift points								
	Center vehicle on lift								
	Place Lift Block/Pads								
	Raise vehicle								
	Perform bump test								

Analysis of Technician Assignments

Our simulation model allowed us to analyze the service times and technician utilization with different amounts of technicians working at a time. We found that as the number of technicians increases the utilization of the technicians decreases and the service times also decrease. When looking at utilization from two to three technicians, there was a 30% decrease. We found that two technicians were the most efficient number of workers to work on a vehicle at a time.

