Felts Family Car Care

Waiting Line Analysis Report

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Business Description

Felts Family Car Care, opened in 2013 by owners Mike and Ruth Felts, is in southeast Burleson, Texas, about a mile from downtown Burleson. Felts Family Car Care is a local automotive service shop that performs preventative and corrective maintenance on automotive vehicles ranging from all years, makes and models. The shop itself, where the repairs are made, include four service lifts, an alignment machine, a tire changing station which includes a tire changing machine and tire balancer, as well as a Kanban system for common supplies, such as a variety of assorted brands and weights of lubricants. The business can provide diagnostics on service lights through their universal diagnostic equipment, engine, and cooling system repairs, steering and suspension system repairs, electrical diagnostics and repairs, brake system repairs, light transmission repairs, air conditioning and heating repairs, and preventative maintenance repairs such as fluid exchanges and filter replacements. Felts Family Car Care is also able to verify repair procedures and repair times to assist with estimate building with their subscription to Alldata and make recommendations for future repairs through technician experience and visual inspection of units. The staff employed are the two owners, two service technicians, one of whom is the owner Mike, one helper and one administrative assistant. Felts Family Car Care markets their services to the local and rural communities east of downtown Burleson.

Their marketing strategy mainly includes word of mouth marketing, which is effective based on the community size and quality of service provided by the shop. Since they are in a rural community it is essential that quality of service is in excellent standing with community so as the shop can continue to thrive. Another marketing technique Felts Family Car Care is using is partnering with neighboring shops via incoming and outgoing referrals.

Industry Environment

The automotive industry is a highly competitive industry at every level, regardless of the type of business. This competitive environment is the same for companies specializing in maintenance and cosmetic work on customer vehicles. Just in the downtown area of Burleson, there are at least 10 other automotive shops that Felts Family Car Care must compete with and convince customers to choose their services. Their competitors include, Chris's Auto Repair, Shelby's Automotive, Stowe's Auto Repair, Wolfe Automotive, Bartlett Auto Repair, Christian Brothers Automotive, which is a franchise, Pauls' Auto A/C Service, Team Hoover Automotive,

Auto Center of Burleson, KC Automotive and Express Lube. This does not include the local dealerships that they must compete with, which include Lynn Smith Chevrolet, Hiley Hyundai, Family Toyota of Burleson, Burleson Nissan, Burleson Honda, and AutoNation Ford. Individuals who buy vehicles from dealerships, tend to have their vehicle maintenance completed by the local dealer where they purchased the vehicle from, where they are offered maintenance packages that expire at a specific time or milage, and warranties that cost the customer nothing at the time of service. After the maintenance packages and warranties expire, the high price of vehicle maintenance drives customers away from the dealers and towards the local mom and pop shops such as Felts Family Car Care.

Competitive Analysis

Felts Family Car Care, being a full-service automotive repair shop, still does have a few limitations on some of the work that may need to be performed on customer vehicles. These repairs include powertrain overhauls, which are engine replacement or rebuilds, transmission replacement or rebuilds, transfer case and differential replacements and rebuilds. These repairs are diagnosed at Felts Family Car Care, however, are referred over to another local shop to verify and conduct the maintenance. In certain seasons like the beginning of summer and beginning of fall, customers tend to bring in their vehicles for maintenance to prepare for summer vacations and back to school. If the customer load is too great at that time, and Felts Family Car Care is unable to complete repairs in a timely fashion, they will refer those customers over to another local shop for them to perform those repairs. Those shops, in turn, will also refer customers to Felts Family Car Care when their customer load is too high. This is a widespread practice among mom-and-pop shops around the country, and it enables the local shops stay in good standing with one another, allows them to share knowledge and information about up-and-coming details in the automotive industry, allows technician networking and allows for those technicians to share knowledge and information on repairs, new tools and equipment, or other information they may not have. This ability to communicate and customer share is a competitive advantage for Felts Family Car Care, by keeping customers coming back to their area for vehicle service instead of going to the downtown shops or the local dealerships for the maintenance needs. Another advantage for Felts Family Car Care is where they are located. Customers on the eastern side of

the city are more likely to stop at their location for vehicle maintenance instead of driving all the way downtown.

At the same time however, a disadvantage is also the physical location of the shop. Being located on the Southeast side of Burleson, customers West of downtown may not be willing to make the drive past more convenient auto repair shops, even if Felts Family Car Care offers better service at better prices. Another disadvantage for Felts Family Car Care is the local dealerships. Dealerships are tailored to their specific vehicle makes and models, which means they have the exact equipment and diagnostic tools necessary to pinpoint repair needs faster and more accurately. Along with that are the warranties offered by the manufacturers that dealerships are obligated to honor. These drive customers away from Felts Family Car Care and into the dealerships. Warranties vary depending on the manufacturer but typically range from 3 years 36,000 miles, which usually covers all repairs, 6 years 60,000 miles which generally cover powertrain repairs, or the extended warranties offered by the dealerships. Most people do not think twice about making the trip to the dealer knowing that their repairs will be covered under warranty, and they will pay next to nothing for the service. There is also limitation on the type of vehicles that Felts Family Car Care can perform repairs on. Fully electric and hybrid systems require special diagnostic equipment and training to work on those types of vehicles. Otherwise, repairs performed incorrectly on electric and hybrid units can result damage to the vehicles computers and modules, but also have to potential to cause bodily harm to the technician as well.

Future Risks

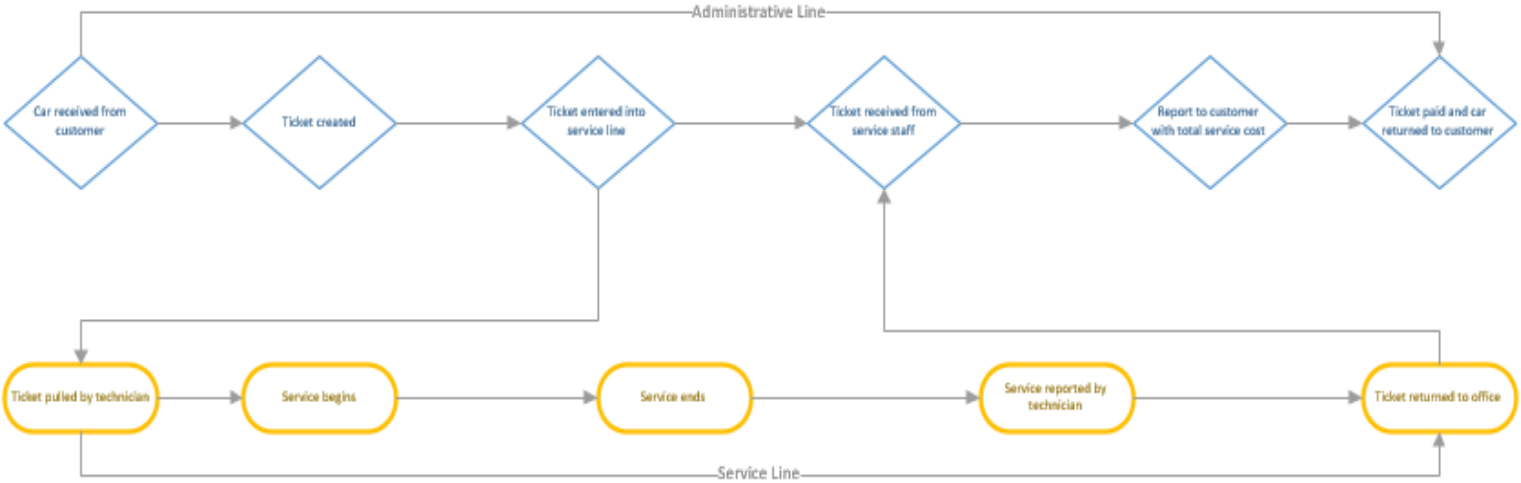
There are a few major risks that we see for the future with Felts Family Car Care. One is that as the Dallas-Fort Worth area continues to grow, the chance that more entrepreneurs who will start a local automotive shop also increases. Depending on the locations of the potential new competitors, it could mean a reduction of customers having their vehicles serviced at Felts Family Car Care. Another risk that we foresee is keeping up with new equipment and technology that could benefit the service rate of the vehicle service. For example, updating the two post lifts with speed motors, which can reduce the time it takes getting the vehicle in a proper servicing position for the technician. Another example is keeping all diagnostic equipment current and updated regularly. If this is not done, the shop is limiting their capabilities of being able to

perform diagnostics, which lead to repairs, on new vehicle make and models and loss of customers.

Multi-Server Waiting Line

Currently at Felts Family Car Care, there are two waiting line systems. The first system is an administrative waiting line. This system is the waiting line of customers dropping off their cars for service where they are entered into the system, the cars being serviced by the technicians, and then the office processing the customer payment. The second waiting line is a service repair waiting line which is a subsystem of the larger system. This subsystem is the waiting line of daily service tickets. Tickets are created by the administration office and are then pulled by one of the technicians. The technicians then pull the corresponding car from the lot, service the vehicle, and then finish reporting and return the tickets to the office for processing and payment. Our project analyzes the service repair service waiting line. Figure 1 below, shows a flow chart of both the administrative waiting line as well as the service waiting line.

Fig.1



Currently, there are two technicians who perform repairs, one of which is Mike Felts, the owner who only works as a technician 75% of the week at most, while his other time is dedicated to administrative and business owner tasks. The other individual is a full-time technician. There is also a helper in the shop who performs light repairs under the guidance of the senior technician or Mike, performs porter duties which allows for the technicians to stay actively engaged in completing repairs, and can go out and source parts when needed. The helper greatly contributes

to the service rate of the shop but is difficult to quantify as their tasks are not tracked and rarely uniform.

Waiting Line Analysis

The data that we were able to gather indicated that this waiting line has an exponentially distributed interarrival time with a mean of 29. The service time is normally distributed with a mean of 60 and standard deviation of 19. Felts Family Car Care operates 9 hours a day or 540 minutes per day with an average arrival rate of 1.238 units per hour and a service rate of .828 per hour. Another variable that we found influences a car's time in the system is the service processing time. This is the time it takes a technician to finish their reporting, return the car to a parking lot space, record any additional information, and then return the ticket to the office system. Management expects this to take between five and ten minutes, and because of this we assume the service processing time has a uniform distribution between five and ten minutes. Our simulation is based on 1000 arrivals at its current state of two technicians, as well as a model with three technicians and a final model with four technicians. In the current two technician system, the average number of vehicles that can be serviced in a single day is about 14 vehicles per day. The probability that vehicles entering the service repair waiting line will expect to be serviced is usually around 85%, with an average wait time of 105.29 minutes and maximum wait time of roughly 190 minutes. Figure 2 illustrates the data associated with the 2-server waiting line model.

Fig. 2

2 Technician Simulation Summary Statistics		
Cars Serviced	14	cars
Number Waiting (Lq)	12	cars
Probability of Waiting (Pw)	85.71%	
Average Wait Time (Wq)	105.29	min
Maximum Wait Time	189.03	min
Number of Cars With 0 Wait	2	cars
Probability of No Wait (p0)	14.29%	
Average number of cars in system (L)	14	cars
Average time in system (W)	179.32	min
Tech 1 Utilization	50%	
Tech 2 Utilization	50%	

As it sits now, the current waiting line system is highly volatile and prone to very quick exponential growth of waiting times. Repeated simulation iterations show that the number of cars the system can handle before waiting time begins to grow exponentially is less than 50. When we added the third technician to the model the simulation indicates that the system can handle roughly 15 units per day. The probability of waiting for vehicles entering the service repair line drops to 46.67%, and the average wait time is reduced to 15.88 minutes with a maximum waiting time of roughly 60 minutes. Figure 3 shows the data associated with an example of a three-server simulation and how the 3rd server improves the service waiting line.

Fig. 3

3 Technician Simulation Summary Statistics		
Cars Serviced	15	cars
Number Waiting (Lq)	7	cars
Probability of Waiting (Pw)	46.67%	
Average Wait Time (Wq)	15.88	min
Maximum Wait Time	57.82	min
Number of Cars With 0 Wait	8	cars
Probability of No Wait (p0)	53.33%	
Average number of cars in system (L)	9	cars
Average time in system (W)	83.96	min
Tech 1 Utilization	33%	
Tech 2 Utilization	33%	
Tech 3 Utilization	34%	

This model still displays high volatility, however the wait times in the model decrease and units serviced increases. Our final model adds the fourth technician into the simulation. With the fourth technician, the model becomes significantly less volatile and increases the number of vehicles serviced in a single day to 14. The probability of waiting for vehicles entering the service line in the four technicians model decreases to 28.6%. The average wait time with four technicians is about 7 minutes and a maximum wait time of roughly 60 minutes. Figure 4 below shows the summary statistics for the four-technician waiting line model.

Fig. 4

4 Technician Simulation Summary Statistics		
Cars Serviced	14	cars
Number Waiting (Lq)	4	cars
Probability of Waiting (Pw)	28.57%	
Average Wait Time (Wq)	6.96	min
Maximum Wait Time	62.41	min
Number of Cars With 0 Wait	10	cars
Probability of No Wait (p0)	71.43%	
Average number of cars in system (L)	6	cars
Average time in system (W)	77.78	min
Tech 1 Utilization	25%	
Tech 2 Utilization	25%	
Tech 3 Utilization	24%	
Tech 4 Utilization	25%	

Group Experience

This group that conducted the research of Felts Family Car Cares service waiting line system has a variety of experience when it comes to dealing with the automotive industry. Some group members prefer taking their vehicles to be serviced by local franchise shops like Firestone, some prefer local mom and pop shops like Felts Family Car Care or performing repairs themselves. Those group members experience however, is based off the administrative waiting line models of those local shops instead of the service waiting line like what was discussed in this report. The groups experience of taking in their vehicles for their maintenance needs varies from waiting for roughly an hour, to having their vehicles at the shop for a few days. There also is a group member who has experience in the industry in the service waiting line, performing both preventative and corrective maintenance as a technician at Toyota, a technician and Assistant Shop Foreman at the City of Fort Worth working with the Police Fleet and Reconditioning Lead at Carvana in the maintenance and cosmetic department. Based on this individual experience with the maintenance side of the industry, Felts Family Car Care is performing above average, taking into consideration the fact that they are performing both

preventative and corrective maintenance repairs and the randomness of repair requirements entering the service line system.

Recommendations

After reviewing the data and running the simulation for the current state, to a four-technician server system, we have several recommendations for Felts Family Car Care. The first recommendation is regarding improving the waiting line. Felts Family Car Care has the capacity to staff the shop floor with four service technicians. In its current state with two technicians, the shop is barely getting by and is only able to service about 12 cars a day. The waiting times grow exponentially to be greater than 200 minutes and the probability of waiting is around 85%. Our recommendation is for the store to move to a three-technician system, as the current operations with two technicians is not efficient. With the 3rd technician, the average waiting time, and the probability of waiting both decrease dramatically, while the number of units serviced.

To justify recommending the 4th server, we would need to compare the cost of waiting versus the cost of hiring the 4th server and compare the cost of the system between the two models. Though the data shows how adding the 4th technician improves the service waiting line, there are periods where the demand does not justify hiring the 4th technician and suggests that the 4th technician would have a negative impact to the business during those periods.