Waiting Line (Queuing Theory) Report for Ulta Beauty

DSCI 4510 Section 002 - Modeling for Business Intelligence

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Part 1 - Introduction to Ulta Beauty

Description of Ultra Beauty

Ulta Beauty, Inc., formerly known as Ulta Salon, Cosmetics & Fragrance Inc., is a USA specialty retailer, and omnichannel retail chain that offers a wide range of cosmetics, skincare, fragrances, haircare, and drugstore-style options, currently selling over 25,000 products (Gninyomo, 2023). Ulta Beauty has "more than 600 established and up-and-coming brands", which also includes their private label called Ulta Beauty Collection (*Ulta Beauty, Inc.* 2025). In addition to their products, they have an in-store salon service that offers a wide range of beauty services. They offer facials, haircuts, hair dyes, make-up consultations, and more.

In 2021, Dave Kimbell became CEO and focused on merging digital and physical retail, creating a seamless innovative experience that enhances customer engagement. Since Ulta is known for its customer relationship management (CRM), Kimbell made a huge impact by including augmented reality (AR) and artificial intelligence (AI), "to personalize shopping and streamline inventory management" (HOM, 2024). This change led to the Ulta app being responsible for 57% of the increase in e-commerce sales during the quarter it was introduced.

Market Ulta Beauty Operates In

Ulta Beauty is in the specialty beauty retailer market. It has become a highly competitive industry that has attracted many mass-market retailers, department stores, and direct-to-consumer online beauty brands. Although the industry isn't a big market globally, it's still growing rapidly with innovative e-commerce ventures and the usage of AI to attract more customers. The beauty industry is expected to grow annually by 6 percent and reach a market cap of $590 billion (McKinsey & Company, 2024).

Key Competitors

One of the primary competitors for Ulta Beauty is Sephora. Sephora is a French multinational specialty beauty retailer that focuses on high-end beauty products. They offer a high-quality wide range of cosmetics, skincare, fragrances, and hair care items just like Ulta Beauty. The main difference between Ulta Beauty and Sephora is that Sephora operates globally and has higher luxury products, unlike Ulta Beauty which caters to a more affordable and drugstore-style market for ages between 16 and 25. A few other key competitors are mass-market retailers like Nordstrom, Target, and Walmart, which are starting to offer a variety of affordable products. Due to this high volume competition, Ulta Beauty has decided to partner

with a few retailers such as Target in order to stay afloat with the competition and offer their affordable products with a variety of audiences.

Competitive Advantages

When it comes to competitive advantages, Ulta Beauty has proven to be a customer-focused company. They have high customer retention with their diverse product offerings, loyalty program, and partnerships, and exclusive collaborations.

- Diverse Product Offerings - Ulta Beauty sells a wide range of price points by giving more affordable drugstore brands and high-end luxury products, which helps to make it more accessible to a wide range of customers. Their assortment of products and price points can "range from $1.50 for an eyeliner to a Dyson Air Wrap that sells for $599" (McKinnon, 2023). This secures the opportunity for beauty enthusiasts who are looking for a more affordable way to spend on beauty products or tools and still be able to try different brands, ultimately giving Ulta a higher customer-focused retention rate.
- Largest Loyalty Program - Ulta is known to have one of the largest loyalty programs, with more than 40 million members in the US. Their program consists of earning rewards as they shop and with their routine sales, they provide even a more affordable shopping experience. Members in the program will receive one point for every dollar they spend, and their savings can lead to 100 points for $3 or 1,000 points for $50 off in savings. They also offer the ability to stack reward points and discounts within their app in order to allow the customer the best deal possible for their continued purchases (McKinnon, 2023).
- Strategic Partnerships & Exclusive Collaborations - Ulta prides itself on exclusive collaborations and strategic partnerships. They've been able to raise their retention level with their customers with these strategies. They have partnerships with major retailers such as Target and Lush, and major brands such as Universal Pictures' Wicked, and Naturium to enhance their skincare line. An example of their most popular collaboration is with Kylie Cosmetics, they sold it exclusively with Ulta as it used to be sold directly to consumers online.

Competitive Disadvantages

As far as competitive disadvantages go, Ulta Beauty does lack in a few ways that other major specialty beauty retailers may better be able to resolve. They have to maintain a higher

upkeep of their salon service costs, keep track of the highly competitive market, and also do it all in a limited global presence.

- Salon Service Costs - Salon services are great on the customer level, but they add additional operational costs. Not only does it mean a higher wait time could occur if a customer needs to shop for products and acquire salon services, but it can also become costly if they don't hire professionally trained stylists. Cutting corners is not something Ulta Beauty can afford to do, as people rely on their affordable prices and their customer-driven strategies.
- Highly Competitive Market - The beauty market is highly competitive, with major retailers like Walmart joining the industry. Ulta Beauty may have joined with one of the major retailers, Target, but that doesn't stop others from doing what Walmart did and providing a wider drugstore-style type of price points. There's also an online competitive market with the rise of e-commerce, which Ulta relies more on in-store sales even if they continue to improve on their omnichannel presence. Ulta Beauty still lacks the strength that other companies have when it comes to online shopping.
- Limited Global Presence - Ulta has a very limited US presence, and unlike Sephora, they are able to market internationally to reach a broad range of audiences. Therefore, only people from the United States of America are able to enjoy what Ulta Beauty provides, and products are very slowly becoming more diverse to increase their main customer audience.

Major Risk for Ulta Beauty in the Future

The major risk for Ulta Beauty is the consumers shifting to online shopping as the e-commerce section of the industry grows. This forces them to implement more changes to how their online shopping works. So far, the only major changes they provided is including AR and AI to improve the way customers shop online. Another risk is the economic downturns, which could lead to an increase in competition of consumers shifting to getting their beauty products from retailers that may be able to afford more deals and lower price ranges.

Part 2 - Current Waiting Line Situation

Currently, the Ulta location we observed at 2314 W University Dr operates with a 2-server, FCFS, shared queue model. Other locations have more than two servers, but the location we observed only had two servers in all five instances of data collection. From the

waiting line model we built, we observed that customers currently spend an average of 0.17 minutes in the waiting line. Customers seemed to be generally happy with the current state of the waiting line however, high traffic times like Saturday afternoon saw an above-average number of customers in line and thus longer wait times. Ulta has more than two registers and will often introduce a third or fourth server during high-traffic times. Although we did not observe this, it is highly likely that this location would increase the number of servers during high-traffic times and alternatively decrease the number of servers during low-traffic times. We will explore the outcomes and possible implications of having more than 2 servers or fewer than 2 servers in our what-if analysis.

According to Google Maps, Ulta's busiest day of the week is Friday, where it is consistently busy all day with peak traffic at 12 pm and 5 pm. The second-busiest day of the week is Saturday, when it is consistently busy all morning and afternoon, with peak traffic at 1 pm and a gradual decrease into the evening. Ulta's slowest days of the week are Sunday and Tuesday. Sundays are consistently low traffic throughout the day, with peak traffic at 4 pm. Similarly, Tuesday is also consistently low traffic throughout the day, with peak traffic at 1 pm. Although Sunday and Tuesday have 'peak' traffic times, it is a very small peak.

Part 3 - Building the Suitable Waiting Line Model

After examining the Google Maps analytics we strategically chose to collect our data in the following instances to capture times of high traffic, low traffic, and medium traffic:

- Saturday Morning
- Saturday Afternoon
- Saturday Evening
- Sunday Afternoon
- Tuesday Afternoon

At each data collection instance, we collected our data by first waiting for the line to reach steady-state operations and then calculating interarrival rates and service rates. At each instance of data collection, there were two servers, and we made note of each individual server's service rate. We will examine these individual server rates and other scenarios in the what-if analysis. We used the 5 instances of data we collected to create the base-case, best-case, and worst-case simulations.

Base Case (average interarrival rate and average service rate across all 5 instances):

For our base case, we took the average of the interarrival times and service times for all five instances of data collection. The interarrival time used was 1.22 minutes and the service rate used was 1.12 minutes. We ran 1000 different dependent trials during our simulation to find information on the efficiency of the waiting line. During our base case, the average waiting time was 1.17 minutes and there was a 0.610 probability of a customer waiting before a server opened up. The probability that a customer would have to wait more than one minute was 0.393 meaning that approximately half of all those waiting had to wait for less than one minute. The longest waiting time during this simulation was 6.4 minutes, and there is a probability of 0.004 that a customer would have to wait more than six minutes out of all 1000 trials.

Best Case (highest interarrival rate and fastest service rate):

For our best case, we took the lowest of the interarrival times and the highest service times for all five instances of data collection. The interarrival time used was 2 minutes and the service rate used was 0.39 minutes. We ran 1000 different dependent trials during our simulation to find information on the efficiency of the waiting line. During our best case, the average waiting time was 0.011 minutes and there was a 0.024 probability of a customer waiting before a server opened up. The probability that a customer would have to wait more than one minute was 0.003, meaning that only three customers in the simulation had to wait longer than a minute. The longest waiting time during this simulation was 1.836 minutes.

With the best case it's important to note that while the case shows greater efficiency than that of the base case, the higher, and therefore slower, interarrival times mean that fewer customers are being served which has the potential to lead to a decrease in the levels of profit that can be earned.

Worst Case (lowest interarrival rate and slowest service rate):

For our worst case, we took the average of the interarrival times and service times for all five instances of data collection. The interarrival time used was 0.83 minutes and the service rate used was 2.24 minutes. We ran 1000 different dependent trials during our simulation to find information on the efficiency of the waiting line. During our worst case, the average waiting time was 266.468 minutes and there was a 0.998 probability of a customer waiting before a server opened up. The probability that a customer would have to wait more than one minute was 0.994 meaning that approximately all of those waiting had to wait for more than one minute. The

longest waiting time during this simulation was 539.123 minutes, and there is a probability of 0.972 that a customer would have to wait more than 20 minutes out of all 1000 trials.

This case shows high amounts of inefficiency that is not sustainable for any business. While this is the worst-case scenario for the two-server model, Ulta should take measures to ensure that this scenario does not have the possibility of occurring in their store. With these measures, the waiting line would continue to grow forever, and the store would never be able to service all of its customers.

What-if Analysis

After creating our base, best, and worst-case scenario simulations, we ran additional simulations to test different scenarios. Here are the following situations we ran simulations on:

- Base case with three servers
- Base case with four servers
- Peak interarrival time with one server and average service time
- Peak interarrival time with 3 servers and average service time
- Slowest service rate with 2 servers

Base Case With Three Servers

When comparing our original base case scenario with 2 servers to our base case with three servers, the probability of waiting is roughly the same. When a third server is introduced, the average wait time is lowered by approximately 30% and the maximum wait time is decreased by approximately 2 minutes. Based on the improvements, we would recommend Ulta to consider hiring an additional server, but it is also important to note that this will incur additional costs. We will consider the additional third server further when examining peak times.

Base Case With Four Servers

When introducing a fourth server, very little improvement is seen. The probability of waiting is approximately the same. The average wait time is approximately the same, and there is only a slight decrease in maximum wait time. We would not recommend that Ulta introduce a fourth server because the additional costs will outweigh the improved line efficiency.

Peak Interarrival Time With One Server and Average Service Rate

Although there were two servers present each time we collected data, this may not always be the case. Thus, we created a model based on our peak interarrival time (Saturday afternoon)

with an average service rate and one server. This serves as a representation of situations where Ulta is short-staffed. The peak interarrival time with one server model shows that there is a 99.9% chance of having to wait, meaning that every customer after the first customer will have to wait. This model also shows extremely high wait times, with an average of 4.3 hours and a maximum of 9.3 hours. Obviously, these numbers are highly unreasonable, and we would advise Ulta to keep a minimum of two servers during peak times like Saturday and Friday afternoons.

Peak Interarrival Time With Three Servers and Average Service Rate

Next, we will reexamine the peak interarrival time situation again, but this time with three servers to accommodate the high traffic. When we introduce a third server, there is still a high probability of wait time, but the wait time is cut in half when there are three servers instead of two. The maximum wait time is also cut in half.

Slowest Service Rate With Two Servers

As previously discussed, we monitored the service rates of individual servers each day. The slowest server was server 2 on Saturday afternoon, and thus we decided to create a model with our average interarrival rate and slowest service rate. When we ran simulations with the slowest service rate collected, the results are drastically different from our base case scenario. The probability of waiting doubles and the average wait time increases from approximately 1 minute to 15 minutes. The maximum wait time also increases from approximately 5 minutes to 30 minutes.

Recommendations

Based on the what-if scenarios, Ulta should consider adding a third server during times of peak traffic (Fridays and Saturdays) as we saw the most improvements in efficiency when comparing the base case with 2 servers to the base case with 3 servers. Only introducing a third server at peak traffic times with increase efficiency and limit incurred costs. Introducing a fourth server will not have much effect on the efficiency of the line and will incur substantial additional costs, so it is not recommended. Ulta should make special consideration to avoid understaffing as best as possible, especially at times of peak traffic as it produces high and extremely unreasonable wait times. Ulta should also be mindful of staff training to ensure all servers are working as efficiently as possible, although it is important to note that a slow service rate can be due to the customer, not the server.

Part 4 - Comparing to Personal Experiences

Based on our shopping experience, the data we collected and the conclusions we made are consistent with those of Ulta locations that are not located downtown in a major city. One of

the key benefits of Ulta is being located near other heavily populated retailers that aren't in the specialty beauty sector. That helps them to consistently have customers as they have affordable products for all. There have been rare experiences that only one server was present during a shopping experience, but they quickly changed that during high-traffic situations. One thing to note from the simulations is that based on experience, the worst case hasn't occurred, and the most common instance was the base case with two servers. Personally, that is the optimal scenario as every server is different and one of them could potentially be slower than the other or a customer could be the cause for a slow service rate.

Part 5 - Managerial Level: How Can We Improve?

As a manager, you can use the waiting line model to improve operations by analyzing the service capacity and customer demand to minimize cost and wait time. By examining key metrics such as arrival rate and service rate, we can determine whether to increase the service rate or add more servers. Increasing the service rate can be achieved by employee training or workflow improvements to reduce service time per customer. Bath and Body Works increases their staff during peak hours to manage high customer flow, especially during the holidays. By also adding self-checkout we can enhance efficiency and decrease the wait time. Adding another server would be the best solution if demand consistently exceeds capacity and, we can reduce customer wait times, and improve satisfaction. From an economic analysis point, the cost analysis shows that the total cost is $1,100 per week. The addition of a new server will not only improve customer satisfaction by reducing the waiting time but also drive higher sales making it a valuable investment for Ulta Beauty.

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