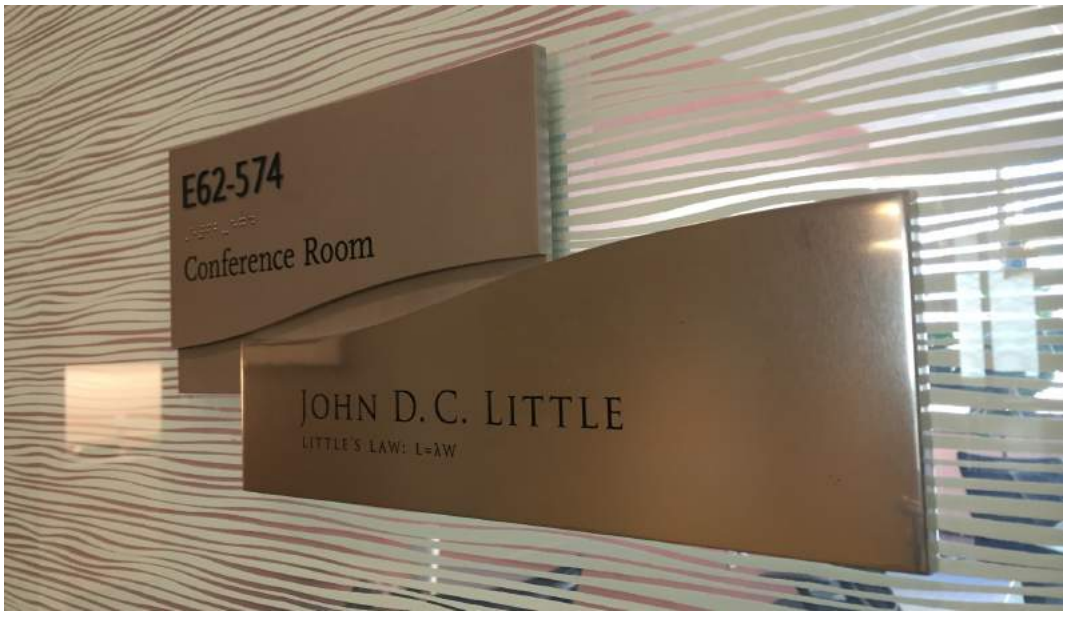
Is it Worth the Wait?

Waiting in line is agonizing. From crossing the airport control border to getting a daily caffeinated fix at Starbucks, it's no surprise that Americans collectively spend on average a frustrating 37 billion hours queuing every year (Stone, 2012). Chances are that you have been through the excruciating experience of waiting in line for something that really hasn't been worth the wait in the end. Sometimes even just a single glance at the long queue snaking back and forth between yellow and black striped belt stanchions can make you instantly queasy. With increased workload and busier schedules than before, people see time as a precious commodity rather than an open space to fill. In the fast-paced urban life today, time is money and patience is not necessarily a virtue. Therefore, managing queues are necessary for businesses like fast food chains and theme parks that require their customers to wait in lines. So how do businesses keep their services efficient and customers satisfied?

To understand how businesses tackle the problem of queuing, I met with professor of Operations Management at the MIT Sloan School of Management, Stephen Graves. In his years as an undergraduate student at Dartmouth College, Graves was first exposed to Operations Research through his summer internship at the Educational Testing Services' Operations Research group. From this experience, he was inspired to develop his passion for management and operations on a deeper level by becoming a professor at the MIT Sloan School of Management and engaging in research. One of his many publications includes a chapter on Little's Law, which he co-authored alongside John Little, a professor of marketing at MIT, who came up with the core relationship within queuing theory that links duration in a system with the number of entities going into that system (Graves, 2015).



This conference room in the E62 building of the MIT Sloan School of Management (coincidently, the room I interviewed Graves in) was donated by Prof. John Little who was the first person to prove Little's Law, which allows us to predict how long the average customer waits in a queue given the number of customers in the line and the average service time. In other words, Little's Law can tell a business how long their customers typically wait (Little & Graves, 2008). This relationship is widely used by businesses to help find out what the most efficient queuing method is.

Here's the million-dollar question: how do businesses make their lines more efficient and boost their revenues?

In short, there are two ways businesses solve this problem. The first is through queuing theory, the study of waiting lines, which involves using mathematics and modeling to optimize queuing processes and reduce wait times. The second is through mind tricks that alter customers' perceptions of how time passes by.

With roughly 69 million customers in over 100 countries a day, McDonald's is the world's leading fast food chain (McDonald's, 2014). So naturally, we expect it to be a prime example of queue management. As the length of time a customer waits often heavily impacts customer satisfaction and ultimately profit, it's very important for businesses to focus on keeping their lines short. To solve this problem, McDonald's hires consultants who use queuing theory to improve queue management.

Graves asserts that there are three ways in which McDonald's uses queuing theory. Since wait time in a queue is largely affected by the amount of time it takes for the servers to complete a customer's order, we can first look at how staffing decisions are made to decrease wait time from the server's end. McDonald's analyses the number of customers who enter the store to decide on how many servers are needed throughout the day to accommodate for peak and off-peak hours. As the demand of hungry customers varies, the number of servers working at certain times of the day varies proportionally. This helps keep lines short and avoids unnecessary shift costs. Queuing theory can also be used to position cooking appliances and staff based on what jobs or stations they cover. Through this, management staff can decide if it would be worth cross-training staff so that they are able to perform multiple tasks. For example, McDonald's can find out if it's more efficient to hire one person who can man a till and retrieve orders or two people- one to take orders and the other to retrieve orders. Lastly, with the help of queuing theory, McDonald's can understand how it can set up its lines to reduce queuing time and keep customer morale high by comparing the analysis and models of different queuing methods (Graves, 2015).

Two methods for setting up queues in fast food chain stores:

Multiple lines to multiple servers

Single line to multiple servers

These illustrations depict two methods that are commonly found in fast food chain stores. The first diagram shows the multiple lines to multiple servers method (the second row is faded). The second shows a single line to multiple servers method. The customers drawn in the queues represent typical customers (e.g. families).

Do we want multiple lines leading to multiple servers or a single line leading to multiple servers?

Graves says, "With all things considered, single lines are probably better" (Graves, 2015). In theory, a single line is better than multiple lines because in multiple lines you can lose capacity if waiting customers do not move between lines. In multiple lines, it is possible to have an empty line with an idle server alongside a busy server with a full line. A single queue that feeds multiple servers will never have any

idle servers while there are still waiting customers. However, multiple lines are only inefficient when people can't bounce between them. In reality, people often move between lines so that there are not as many idle servers and waiting customers at the same time in multiple lines.

When it comes to customer service, McDonald's primary goal is not just to reduce wait times but also to increase customer satisfaction. It is true that a very long single line can be off-putting to customers as shorter, multiple lines can be more appealing, especially when there are families of four to five people clustered in one line but very few people in another. However, favoring the single line method is the customer's sense of justice (Bialik, 2009). A customer will usually find the wait longer and more aggravating if he or she sees that another customer who arrived later is served first, which is a common occurrence in check-out areas with multiple waiting lines. "Just-World fallacy" describes the cognitive bias in which humans think that the world is a fair place where everyone gets what they deserve (McRaney, 2010). So when the chaos of reality erupts and the person who lined up behind you gets their pumpkin spice latte first- you become agitated and lose patience.

The thinking goes that one of the main reasons why a fast food chain store would use the multiple lines method is because it can often induce positive service behavior, which means that servers are motivated to work harder. It is easier for a slow or a lazy server to be hidden if there is only a single line. If there are multiple lines, it's harder to be hidden as the length of the line or speed at which a certain server's line moves reveals the efficiency of the server (Graves, 2015).

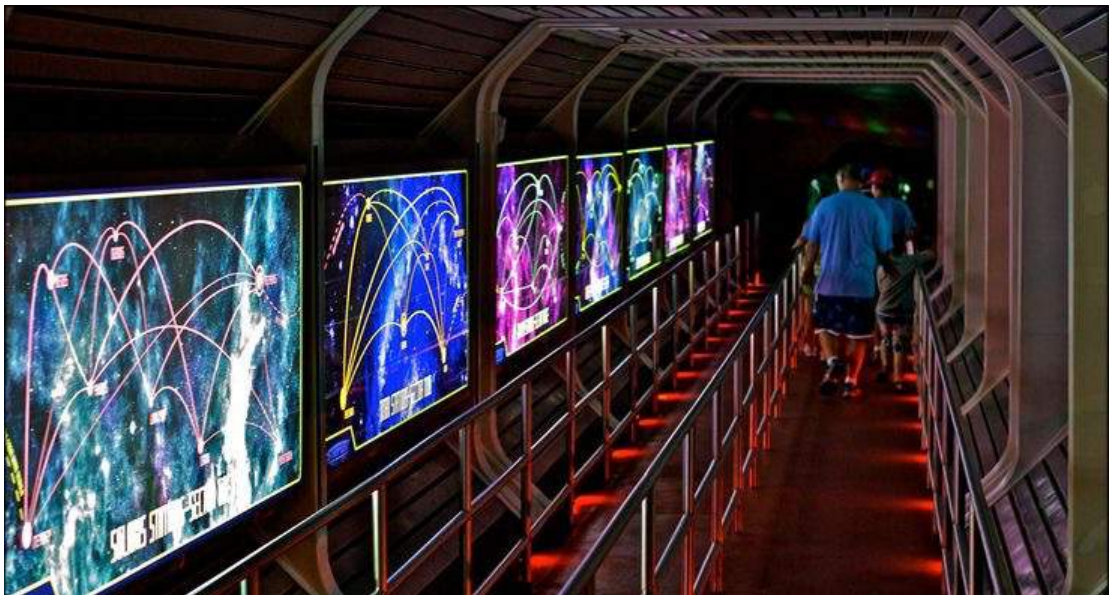
What if the queue was more than 10 to 20 people long? What if the queue was for a ride in Disneyland, which could have hundreds of people at a time?

To handle its over 30 million annual visitors, Disney uses a similar methodology of queue management to McDonald's (Barnes, 2010). However, with lines hundreds of people long, no matter how efficient the queue is, Disney's customers still have to wait very long periods of time. For McDonald's, a minute or two is an acceptable wait time but for Disney's popular rides, a 30 to 60 minute wait is often acceptable. In McDonald's case, multiple lines work well for relatively short queues and wait times. In Disney's case, long queues and wait times call for an additional plan of action to supplement their efficient queuing methods. Waits that are too lengthy could discourage the customer from repeat purchases. With fewer customers to serve- Disney loses profit. So to make long queues feel short, Disney plays a host of mind tricks on its customers (Graves, 2015).

Luckily for Disney, humans have inaccurate perceptions of time according to a study conducted in Berlin (Delistraty, 2015). Sometimes a thirty-minute wait can feel like a five-minute wait. A more economical approach to this problem would be to focus on the customer's waiting experience rather than increasing service capacity. With this in mind, Disney very cleverly uses the disparity between the wait time that the customer perceives and the wait time that the customer actually experiences to its advantage.

Since time passes more quickly when you're occupied with a task, Disney intentionally designs their queues to make waits more pleasurable by keeping customers

entertained. According to the research paper, "*The Psychology of Waiting Lines*," by David Maister, these measures have huge effects on wait time perceptions and increase customer satisfaction (Maister, 2005). For example, one of Disney's more popular rides is Space Mountain, which has 87 video game stations with 90-second games alongside the queue to make waiting more enjoyable (Barnes, 2010). In addition to installing videos and interactive activities, Disney tries to make its lines as narrow as possible so that customers feel as if they are always moving forwards. Some queues are even arranged in a way that encourages people to spend money as they wait as a method of boosting Disney's in-park revenues. Psychological tricks like these are very valuable to Disney as they help make the entire Disneyland experience more satisfying to visitors, which leads to increased repeat visits.



Disney World's Space Mountain ride queue has 87 video game stations alongside so that visitors are entertained as they wait. Such distractions make waits more enjoyable and shorter for customers than they really are. By combining fun distractions with narrow lines, Disney has been able to reduce wait times and keep customers happy (Robinson, 2011).

What's the best way to cut down wait time?

The most foolproof way to reduce wait time is simple: hire more servers. Sure, speeding up service time burns a hole in the pocket but if calculated and predicted carefully, the pros of more customers served at a time can outweigh the cons of hiring additional employees (Little & Graves, 2008). Businesses often struggle with staffing decisions. Graves says, "it's a bit of an economic trade-off. You have to ask yourself-do I want to try to run this with my servers being 90% or 99.9% busy?" (Graves, 2015). Beyond that, queue management is essentially a juggling act between queuing theory and psychology. A good queuing method can maximize the efficiency of service and psychological tricks can help maintain high customer morale. However, even though businesses are often very creative and successful in making waits pleasant, the wait length is ultimately dependent upon how efficient servers are at delivering to the customer's needs.

What's queuing in the future going to be like?

Having been immersed in Operations Research for most of his life, Graves admits that he frequently analyses queues.
"Whenever a buffet is set up, you quite often notice how poorly it is set up from a server's standpoint," Graves sighs. Simple things such as seeing a buffet table up against the wall and the salad bar at the end of the table are enough to get on his nerves.
"If we could take the buffet away from the way and have two lines instead of one and think about how the stations are laid out so people wouldn't back up- the system would be a lot more efficient," (Graves, 2015).

Increased self-checkout stations in McDonald's (as seen above) speed up service times and could lead to decreased queuing times in the future (Durden, 2015).

Fortunately for Graves, customers are becoming more aware of how they can avoid queues. Although we probably won't able to avoid queuing completely, we can at least make waiting more bearable. With the proliferation of new technology and increasing popularity of online shopping, it is now easier to obtain information in real-time, which allows customers to adjust and tailor their plans.
"I suspect in the future that when I say I want to eat Italian, and I don't want to wait more than five minutes or drive more than 6 miles, an app on my iPhone will say, 'OK Mr. Graves- this is where you should go,'" (Graves, 2015). As self-checkout lines and dine-and-dash apps spread like common cold in the winter, the possibility of shorter queues and reduced wait times is becoming more of a reality.

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