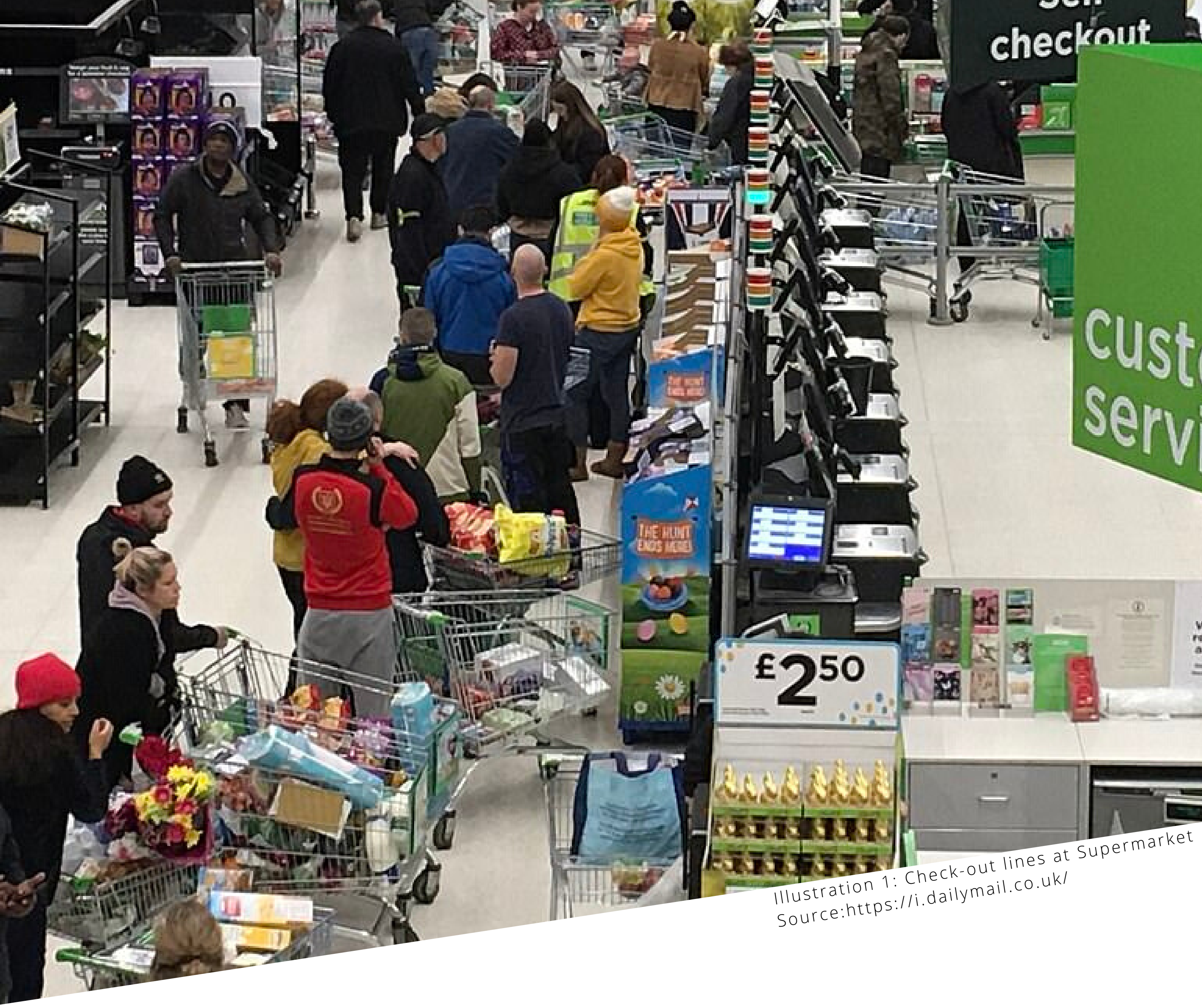


Illustration 1: Check-out lines at Supermarket
Source:https://i.dailymail.co.uk/

ANALYSING PREDICTORS TO IDENTIFY THE FASTEST CHECK-OUT LINE IN A SUPERMARKET

26 JUNE 2020 // PREPARED BY ADITYA RAWAT

A research study showed that on average people spend 29 minutes weekly in supermarket queues. This approximates to 2 hours a month, or almost 1 and a half days queuing annually. To make the most of our time, there needs to be a way to predict the fastest queue, before entering the queue itself ("Wait in line", 2012).
In this report, I'm listing down the possible predictors that one might use to guess the least time taking queue from a collection of queues with each having an equal probability of people joining them.

- **Past Experience**: For regular and frequent customers to the supermarket, their past experience helps to find the fast-moving queue. The local people generally know the store pretty well. For example, they know who the fastest cashier is and which register has the drawers that always get stuck. They even spot the customer that spends an age looking for changes in his wallet. Apart from careful queue selection, people might also switch lanes.

- **Which one is faster a short queue of 3 people with 20 items each or a long queue of 6 people with 5 items each?** According to research, every person takes an average of 48 seconds to say hello, pay, say goodbye and clear out of the checkout and every item takes about 3 seconds each to be scanned and bagged ("What I Would Do", 2009). Therefore a customer getting to the check-out lines should pick the line with the lowest overall time for processing. Hence to answer the above question, it will take 324 seconds for the shorter queue and 378 seconds for the long queue. That means getting in line with more people who have fewer things can be a poor choice.

- **When can a longer queue be faster than the shorter queue?** To answer this, Find out the reason why the shorter queue is short. If a queue is shorter due to following reasons: Problem reading the bar code in some of the items by the cashier, or when the customer is unable to pay, due to having insufficient cash to pay, or because their cards are rejected, which can, of course, lead to a considerable delay, choose the long queue with less number of items.

- **Type of items:** Another factor that can be helpful is not just considering the number of items in people's cart but also considering the type of items. It's faster for the cashier to process 10 bottles of beers than 10 different items. Also, notice whether people in front of you have a lot of loose fruits/veggies as it takes longer to weigh them.

- **Cashier's and machine efficiency:** Checking the speed of cashier from afar. If they are fast and skillful, joining that queue can be more beneficial. Avoid queues with slow, chatty, and clumsy cashiers. Another point that can be considered is, knowing whether the cashier's view is obstructed by a wall or a shelf. If the cashier is aware of the queue, then there are high chances that he/she will process the checkouts faster.


Source: https://image.freepik.com/free-vecto

- **Mode of payment with respect to Age-group of people standing in the queue:** Generally the younger generation prefers to pay during check-out with different digital payment methods like debit cards, Paypal, etc, and hence the checkout process is faster. Whereas elder people are a bit slower due to their infirmity while carrying bags or executing digital transactions.

- **Gender of people standing in the queue:** Males, due to their general characteristics don't buy as much. On the other hand, females tend to shop more and lead more conversation with the cashiers about the products and the services.

Recommended best predictors

- Identifying the fast cashier using past experience or by checking how efficient cashier is. Also ensuring that the cashier's view is not obstructed by walls and shelves and he's aware about the queue.
- Avoid standing in queues with more old people, women, and anybody with kids is buying in bulk.
- Choose shorter queues having more items than longer queues having a smaller number of items.
- Choose longer queues if shorter queues are short due to problems at the cash counter like error reading the bar code, or that the bar code was missing or had been torn off or payment related issues with a customer, etc.
- Join queue where people carry mores similar items like 10 beer bottles, etc.

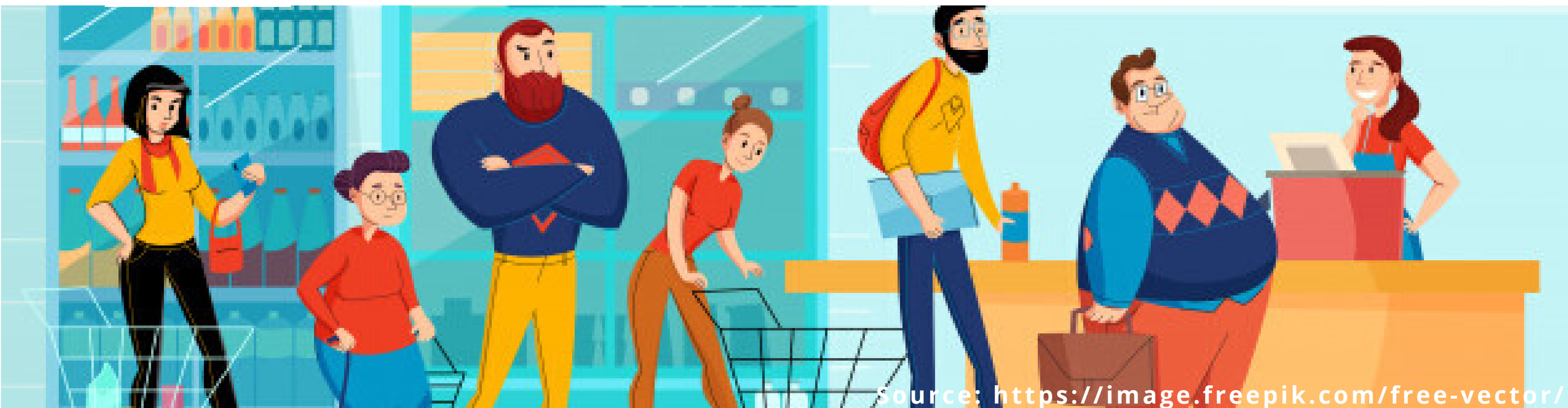
Additional Reads

Queuing theory:

If we have historical data, we can use queuing theory to estimate average waiting time for each queue and join the queue with the least predicted waiting time. For using theory we will need the estimate of the following values:

λ: The mean customer's arrival rate i.e the number of customers arriving per unit time.
μ: The mean service rate i.e. the number of customers being served per unit time
ρ = **λ/μ**: utilization factor i.e. percentage of the time that all servers are busy

Each queue can be modelled using M/M/1 Queuing System where M stands for Markovian/Memoryless Poisson Process i.e. the probability distribution of arrival time of customers follows Poisson distribution and the distribution for service time of cashiers follows Exponential distribution and 1 represents that there's one cashier per queue.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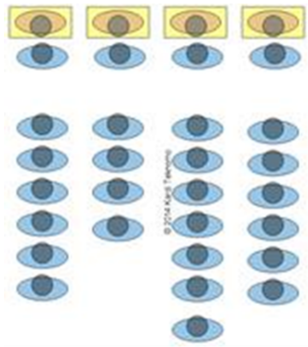

Illustration 2: M/M/1 queuing system
Source: https://people.revoledu.com/kardi/tutorial/Queuing/

The average waiting time at each queue can be calculated using formula:

$$W = \rho/(\mu-\lambda)$$

After calculating W for each queue, we can find the least time taking queue. A note, as arrival time rate and service rate keeps changing with time we can keep updating the waiting time for each queue. A drawback of using queuing theory is to keep an update of the arrival time as well as the service time rate (Bhathawala & Jhala, 2017).

Murphy's law

According to Murphy's Law, " Anything that can go wrong, will go wrong ". When we queue up, there are three queues we care about: the one we're in, plus the two queues to either side. So the chances our queue will beat both our neighbors are just 1 in 3. In other words, in almost 70 percent of trips to the supermarket, Murphy's Law will prove correct, and one or other of the queues next to us will beat ours! ("Murphy's Law", n.d.)


Source: https://image.freepik.com/free-vector

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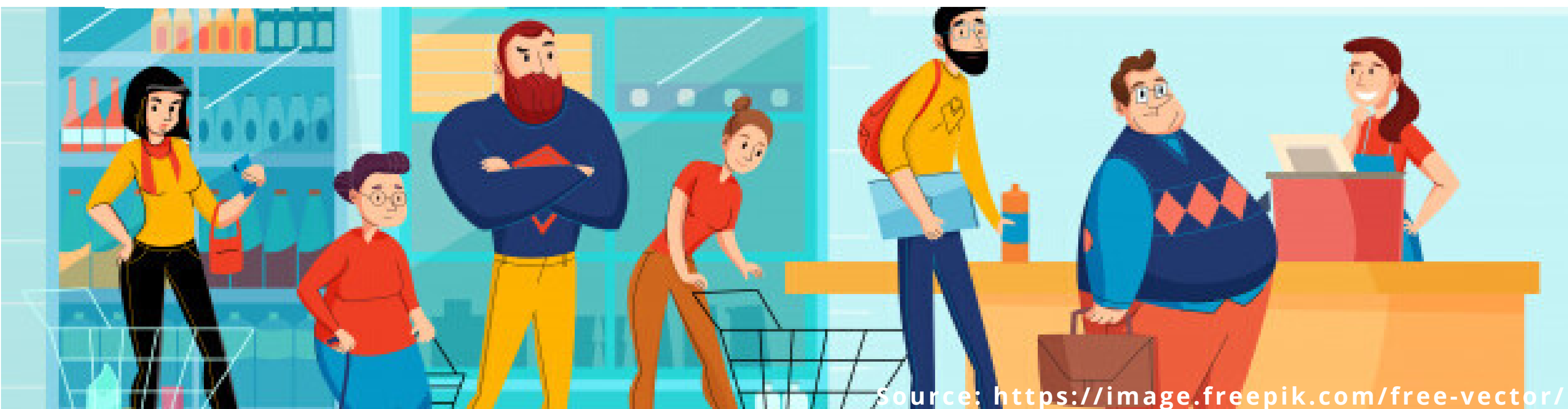

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