Bank Simulation

UNIVERSE 7

Motivation:

Understanding Interactions between Tellers and Customers can help:

- Improve Work Efficiency and Customer Experience.
- Identify Points of Congestion in a Process.
- Create Optimal Schedules.

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Problem Statement:

- **Customers** arrive at a bank at random times throughout the day.
- The bank has a given number of **Tellers** that help customers.
- **Customers** wait in a **Queue** until they are helped.

Relevant Questions:

- How does increasing/decreasing the number of tellers affect customer wait time?
- How will the creation of a separate queue for light requests affect customer wait?
- How does a separate queue affect the total number of customers that are served in a day?
- How does additional tellers affect work efficiency?

Approach:

Exogenous
(prior to simulation)

Customer Arrival Time

Endogenous
(during simulation)

Teller Availability

Assumptions

- **Customers** waiting in line at closing will not be helped.
- **Tellers** work at the same speed.
- Light Request **Customers** require less than 19 minutes of help.
- Light Request **Customers** must use the Light Request Line.

Approach:

Queues:

Create two separate priority queues.

- **Customer Queue**
- **Teller Queue**

Logic:

- While the **Teller Queue** has **Tellers** and the **Customer Queue** has **Customers**:
  - pop Teller
  - pop Customer
  - Calculate Teller's next available time then add Teller back into Teller Queue.

Metrics:

- Average Customer Wait Time
- Teller idle time
- Unserved Customers

Teller

Available Time:

The Time that a Teller becomes available to help the next Customer.

Work Rate:

Tellers assist Customers at 10 Work Units/Hour.

Customer

Arrival Time:

Uniform distribution over 8 hours.
160 Customers arrive every day.

Work:

Amount of assistance needed.
Follows a normal distribution of N(5, 2.5)

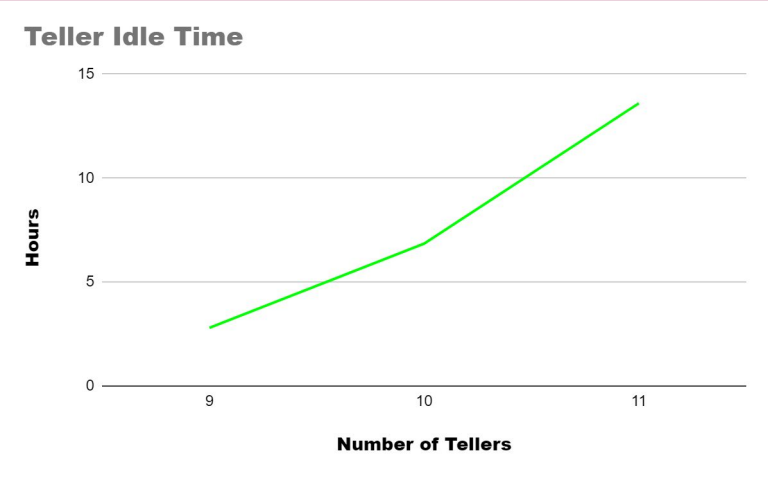
- 15-45 minutes or work per Customer

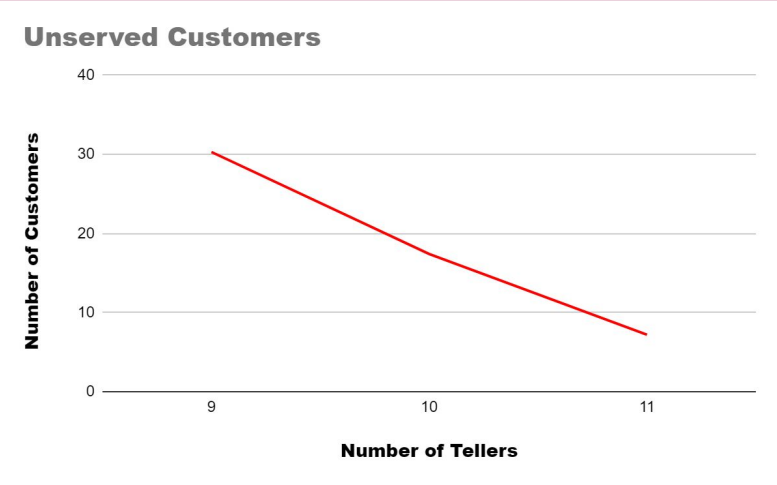
Results

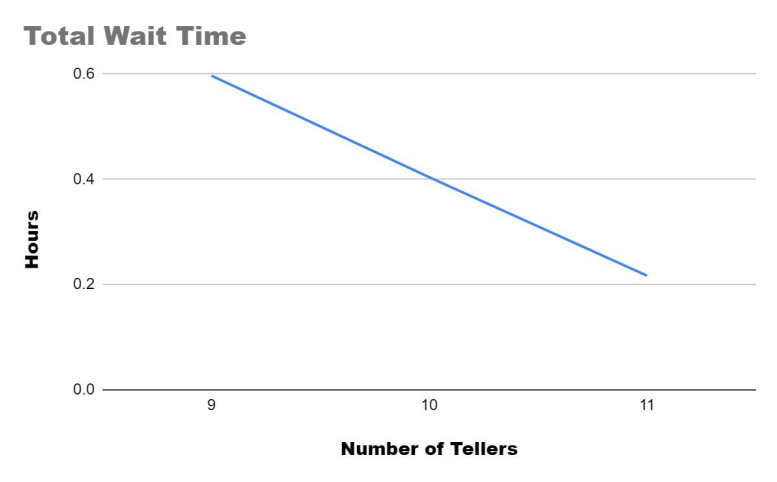
	10 Tellers	1 Light Request Teller, 9 Standard Tellers	11 Tellers	9 Tellers
Total Wait Time (hours)	0.404	0.457	0.217	0.597
Light Request Customer Wait Time (hours)	x	0.181	x	x
Standard Customer Wait Time (hours)	x	0.496	x	x
Unserved Customer	17.4	20.9	7.2	30.3
Teller Idle Time (hours)	6.85	20.00	13.60	2.80

Results:

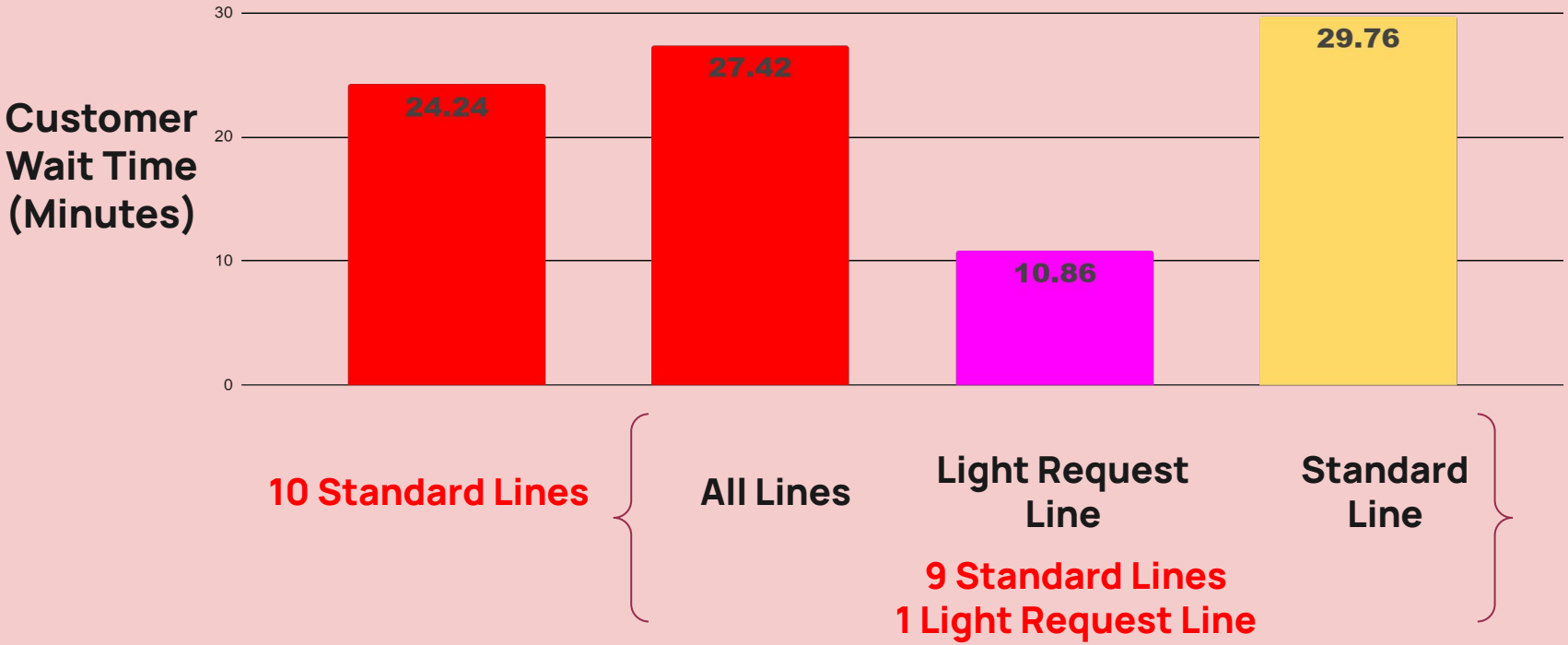
- Increased Customer Service means reduced Efficiency.







Results



Note: Light Request Line Limit is 18.6 Minutes

Conclusions

- ★ More Tellers decreases Customer wait time and serves more Customers.
- ★ More Tellers reduces work efficiency.
- ★ The Light Request Line increases total Customer wait time. (Faster for Light Request Customers, slower for Standard Customers)
- ★ The Light Request Line causes fewer Customers to be assisted. (More Light Request Customers assisted, less Standard Customers)