South Campus Diner
Staffing and Queuing Examples

General Service Rate Info.

- At a “regular” station, where customers receive pre-prepared food, it takes approximately one minute for one staff member to serve one customer.
- At an “active” station, where customers order custom dishes that are made in front of them, it takes approximately five minutes for one staff member to serve one customer.

- Source: Cafeteria Redesign Handout

South Campus Diner Info.

- Avg. demand: 1,000 guests per hour between 4:00 and 8:00 PM
- Peak demand: 1,750 guests
- Emmas is estimated to capture 10% of this traffic (regular station)
- Seasons 12 is estimated to capture 15% of this traffic (active station)
- Current staffing at:
  - Emmas = 3
  - Seasons 12 = 8

- All numbers are hypothetical.

Staffing

- $U = \frac{R \times T}{m}$
- Where:
  - U = utilization
  - R = arrival rate (people per minute)
  - T = service rate (minutes)
  - m = number of staffers

Let’s look at staffing utilization at each station during a normal dinner service.

Emmas:

$$U_{avg} = ?$$
$$U_{pk} = ?$$

Seasons 12:

$$U_{avg} = ?$$
$$U_{pk} = ?$$

U at Emmas

$$R_{avg} = 0.10 \times \left(\frac{1\ hour}{60\ minutes}\right) \times \frac{1{,}000\ guests}{1\ hour}$$

$$R_{avg} = 1.667\ \frac{guests}{minute} \approx 2\frac{guests}{minute}$$

$$R_{pk} = 0.10 \times \left(\frac{1\ hour}{60\ minutes}\right) \times \frac{1{,}750\ guests}{1\ hour}$$

$$R_{pk} = 2.917\frac{guests}{minute} \approx 3\frac{guests}{minute}$$

U at Emmas (Cont'd)

$$T_{regular} = 1\ \frac{minute}{guest}\ ;\ m_{em} = 3$$

$$U_{avg} = \left(\frac{2\frac{guests}{minute} \times 1\frac{minute}{guest}}{3}\right)$$

$$U_{avg} = 0.667$$

Similarly: $U_{pk} = 1.000$

U at Seasons 12

$$R_{avg} = 0.15 \times \left(\frac{1\ hour}{60\ minutes}\right) \times \frac{1{,}000\ guests}{1\ hour}$$

$$R_{avg} = 2.500\ \frac{guests}{minute} \approx 3\ \frac{guests}{minute}$$

$$R_{pk} = 0.15 \times \left(\frac{1\ hour}{60\ minutes}\right) \times \frac{1{,}750\ guests}{1\ hour}$$

$$R_{pk} = 4.375\ \frac{guests}{minute} \approx 5\ \frac{guests}{minute}$$

U at Seasons 12 (cont'd)

$$T_{active} = 5\ \frac{minute}{guest}\ ;\ m_{s12} = 8$$

$$U_{avg} = \left(\frac{3\ \frac{guests}{minute} \times 5\ \frac{minute}{guest}}{8}\right)$$

$$U_{avg} = 1.875$$

Similarly: $U_{pk} = 3.125$

Queuing

- $N = R \times L$
- $F = \frac{N \times T}{m} = U \times L$
- $W = \frac{F - L}{2}$
- Where:
  - U = utilization
  - R = arrival rate (people per minute)
  - T = service rate (minutes)
  - m = number of staffers
  - L = length of rush (minutes)
  - F = time needed to serve all customers (minutes)
  - W = average wait time

Let’s look at a rush from 6:00 to 7:00 PM, based on peak demand.

$$F_{em} = ?$$
$$F_{s12} = ?$$

$$W_{em} = ?$$
$$W_{s12} = ?$$

F at Emmas

- From before, we know:

$$R_{pk} \approx 3\,\frac{guests}{minute};\; T_{regular} = 1\;\frac{minute}{guest};\; m_{em} = 3$$

$$N_{em} = 3\,\frac{guests}{minute} \times 60\;minutes$$

$$N_{em} = 180\;guests$$

F at Emmas (cont'd)

$$F_{em} = \left(\frac{180\ guests \times 1\ \frac{minute}{guest}}{3} \right)$$

$$F_{em} = 60\ minutes$$

W at Emmas

$$W_{em} = \frac{60\ minutes - 60\ minutes}{2}$$

$$W_{em} = 0\ minutes$$

F at Seasons 12

- From before, we know:

$$R_{pk} \approx 5\,\frac{guests}{minute};\; T_{active} = 5\;\frac{minute}{guest};\; m_{s12} = 3$$

$$N_{s12} = 5\,\frac{guests}{minute} \times 60\;minutes$$

$$N_{s12} = 300\;guests$$

F at Emmas (cont'd)

$$F_{s12} = \left(\frac{300\ guests \times 5\ \frac{minute}{guest}}{8} \right)$$

$$F_{s12} = 187.5\ minutes$$

W at Emmas

$$W_{s12} = \frac{187.5\ minutes - 60\ minutes}{2}$$

$$W_{s12} = 63.75\ minutes$$