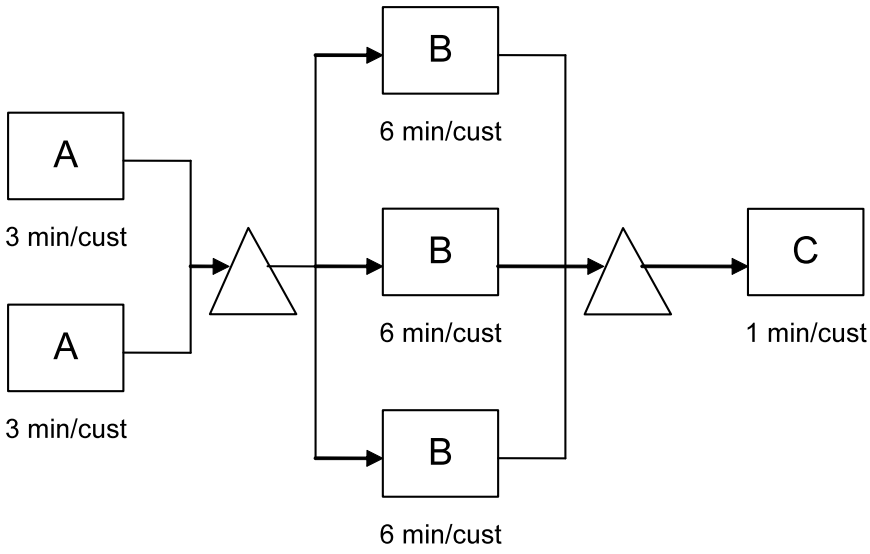
OM 335H **E. Anderson** **Homework-3**

SOLUTIONS

PROCESS FLOW ANALYSIS

Assume 1 clerk per operation for the following 2 deterministic processes.



1. What is the bottleneck, process cycle time, process capacity, rush-order throughput (or flow) time? What is the labor utilization for the process flow diagram shown above if customers arrive every 5 minutes? (You may need to use a Gannt Chart if you're stuck.) Hint: Utilization is a steady-state measure.

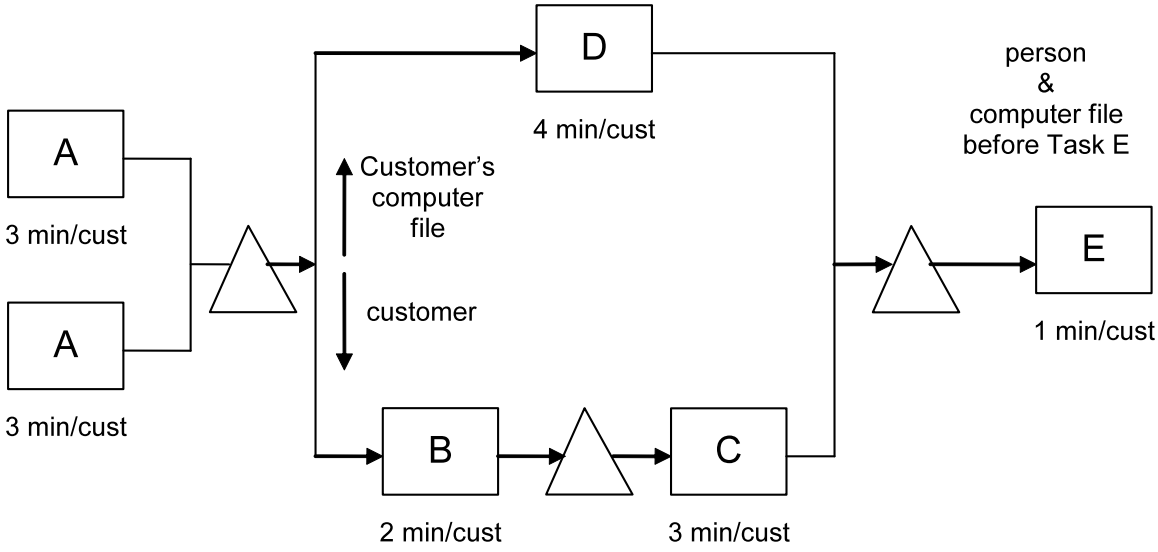
B-Neck=B's Clerks; CT(process) = CT(B-neck)= 6mins/3custs = 2 mins/cust;
Process Capacity = 1/Process CT * (60min/hr)= 30 custs/hr; ROFT = 10 mins;

Since the CT is less than how often customers are arriving, the system is starved, which means that every resource in the process will have a thruput of 1 customer every 5 minutes, i.e. have a takt time of 5 minutes/customer.

Labor Content per customer by resource:
LC(a) = 3m/(2 customers) = 1.5 m/cust
LC(b) = 6m/(3 customers) = 2 m/cust
LC(c) = 1m cust

U(a) = LC(a)/Takt Time(a) = (1.5 m/cust)/(5 m/cust) = 30%
U(b) = LC(b)/Takt Time(b) = (2 m/cust)/(5 m/cust) = 40%
U(a) = LC(a)/Takt Time(a) = (1 m/cust)/(5 m/cust) = 20%

Avg. Labor Utilization = 1/6 * [2*U(a) + 3*U(b) +U(c)] = 33%



What is the bottleneck, process cycle time, process capacity, and the rush-order throughput (or flow) time? What is the labor utilization for the process flow diagram shown above if customers arrive every 5 minutes? (You may need to use a Gantt chart if you're stuck.)

B-Neck=D's clerk; CT (Process) = CT(B-neck)= max(CT_B, CT_C, CT_D) = 4 mins/cust;
Process Capacity = 1/CT(Process) * (60min/hr)= 15 custs/hr; ROFT = 9 mins;

Takt time for the resources is again 5m/customer.

Labor Content per customer by resource:
LC(a) = 3m/(2 customers) = 1.5 m/cust
LC(b) = 2m/cust
LC(c) = 3m/cust
LC(d) = 4m/cust
LC(e) = 1m/cust

U(a) = LC(a)/Takt Time(a) = (1.5 m/cust)/(5 m/cust) = 30%
U(b) = LC(b)/Takt Time(b) = (2 m/cust)/(5 m/cust) = 40%
U(c) = LC(c)/Takt Time(c) = (3 m/cust)/(5 m/cust) = 60%
U(d) = LC(d)/Takt Time(d) = (4 m/cust)/(5 m/cust) = 80%
U(e) = LC(e)/Takt Time(e) = (1 m/cust)/(5 m/cust) = 20%

Avg. Labor Utilization = 1/6 * [2*U(a) + U(b) +U(c)+ U(d) + U(e)] = 43.3%

3. In a short answer, explain qualitatively in your own words how the parallel like activities (as in question 1) and parallel unlike activities (as in question 2) differ in their effects upon utilization, flowtime, and capacity.

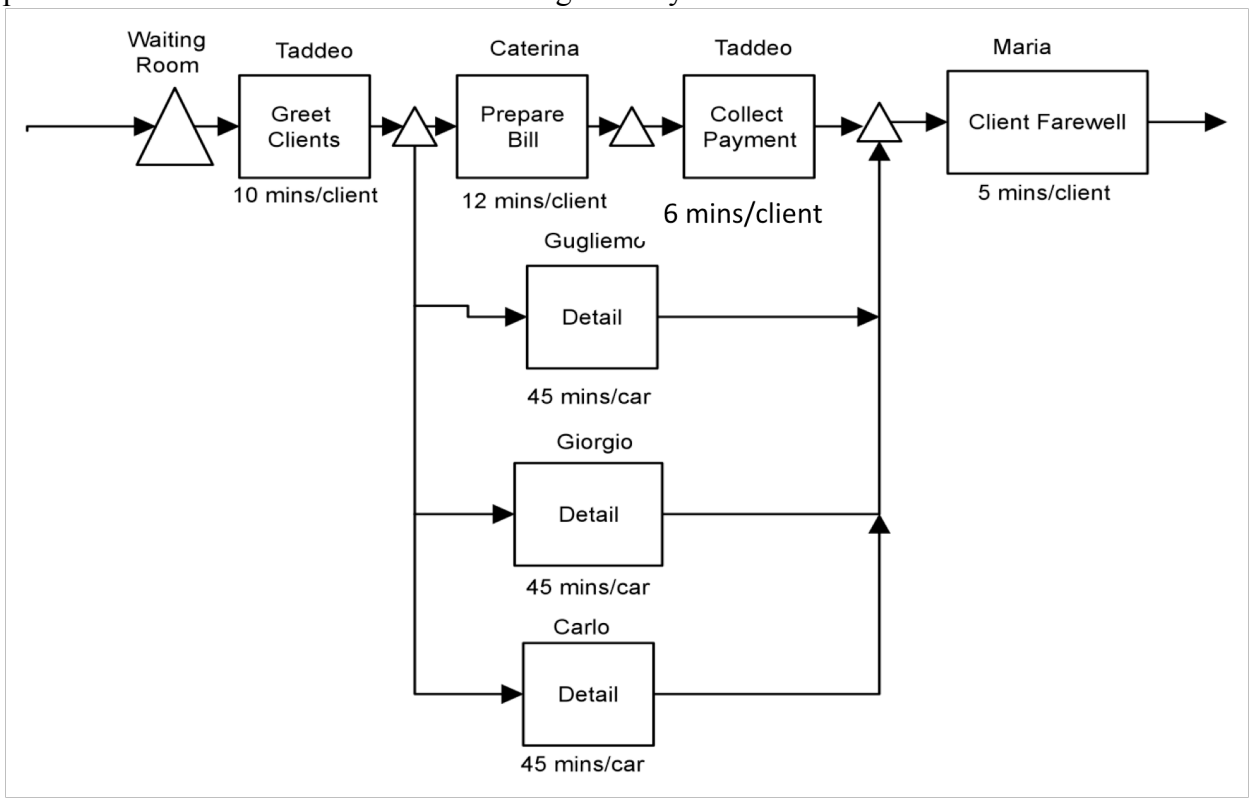
Answers will vary

MORE PROCESS ANANLYSIS

2. Westlake Custom Car Detail (WCCD) provides detailing (intensive car cleaning) services to antique and collector cars. Taddeo D'Andrea, the owner of the establishment has an online webpage which schedules appointments for car owners so that the arrival rate of cars at WCCD never exceeds its process capacity, (i.e. it's run as a just-in-time process). Taddeo has asked you, as a fellow UT BBA alum, to take a look at his process and make recommendations about how to improve it.

Your first task was to document the process flow, which is shown below. Taddeo greets the clients, asks some background information, and then directs the car to one of the detailers, while the client is sent to a waiting room while the bill is prepared by Caterina. Taddeo then collects the payment himself. After both the payment is collected and the detailing completed, Maria guides the client to the car and says goodbye.

Your next task is to perform analysis of the common operations metrics as shown in the sub-problems below. Note that each client brings exactly one car to WCCD.



1. What is the Rush Order Flow time of the process above in minutes?

ROFT = 10 m + min(12m + 6m, 45m) + 5m = 60 mins

2. What is the process capacity in clients/hour?

Taddeo has the highest labor content at LC(taddeo) = CT (greet) + CT(collect pay't) = 16 mins/client. Hence, the process capacity is 1/16 client/min * 60 mins/hr = 3.75 custs/hour

3. If there is an average of 11 cars at WCCD at any one time and the thruput is 3 cars per hour, what is the average amount of time a car spends at WCCD?

Using Little's Law,

FT = L/thruput = 11 cars / (3 cars/hour) = 3.67 hours

4. What is the average labor utilization overall for this process, again assuming that the thruput is 3 cars per hour?

First, note because the arrival rate is less than the process capacity, that the process is starved. Hence, the throughput will be same for all the resources at 3 cars per hour, and thus the takt time for all the resources will be 1/3 of a car/hour or 20 mins/car.

LC(Taddeo) = CT(greet) + CT(payment) = 10 m/client + 6 m/client = 16 m/car
LC(Caterina) = CT(prepare bill) = 12 m/car
LC(Maria) = CT(farewell) = 5 m/car
LC(Each Detailer) = CT(detail) = 45 m/(3 clients) [[or (1/3) * 45m/client]] = 15 m/car

U(Taddeo) = [(Taddeo's labor content)/(Taddeo's takt time)] = (16 m/car)/(20 m/car) = 80%
U(Caterina) = (12 m/car)/(20 m/car) = 60%
U(Maria) = (5 m/car)/(20 m/car) = 25%
U(Each Detailer) = (15 m/car)/(20 m/car) = 75%

Uavg = (1/6) * (80% + 60% + 25% + 3*75%) = 65%

Uavg = (1/6)* [Utaddeo + Ucaterina + Umaria + 3*Udetailer]
= (1/6)* [(Taddeo's labor content)/(Taddeo's takt time)

PREPARATION FOR ZIPCAR

1. Answers will be handed out in class.

2. Answers will vary.

3. Answers will vary.