

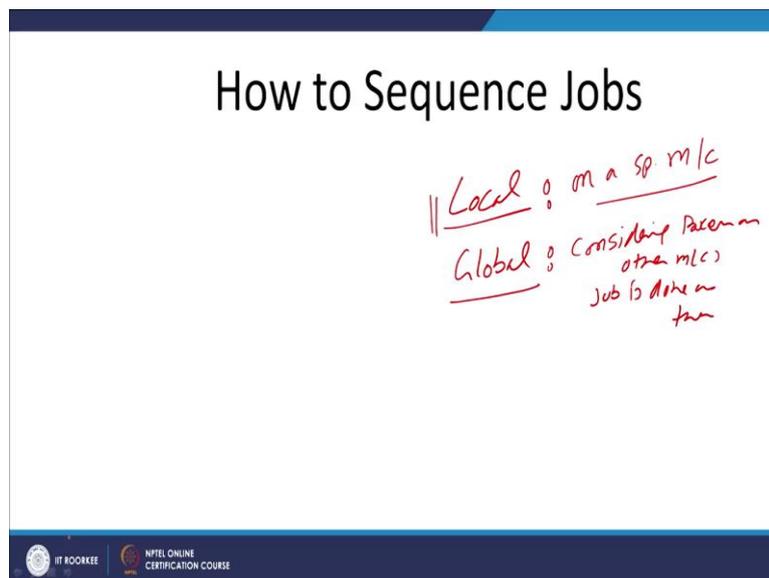
Principles of Industrial Engineering
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Lecture 35

Relative Performance of Priority Sequencing Rules

Hello, I welcome you all in this presentation related with the subject Principles of Industrial Engineering and we are talking about the scheduling. In the scheduling there are different methods which are used. The Gantt chart is one. Then priority sequencing rules is the another and the Project Evaluation and Review Technique and the Critical Path Method are the other mathematical methods.

In the previous presentation we talked about the priority sequencing rules. There are various types of the rules and their effectiveness is different. So, in this presentation or in this lecture basically we will be talking about how good the various rules will be when they are applied for sequencing.

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So, as far as the sequencing is concerned there are two broad approaches. One is like the local, and another is global. In case when the sequencing, priority sequencing rule is applied on a specific machine then it is termed as or it comes under the category of the local sequencing and when it considers that how the products will be passing through the different systems so that the job or entire batch is completed on time, so that is about the global.

So in case of the global sequencing it considers the processing on other machines as well so that, and it makes sure that the job is done on time. So, this is what we can say the difference in the local and the global.

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How to Sequence Jobs

- Priority rules:
 - Local priority rules: determines priority based only on jobs at that workstation
 - Global priority rules: also considers the remaining workstations a job must pass through

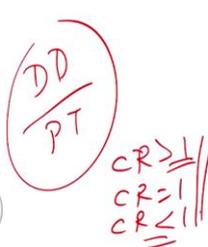


So, the local priority rules determines the priority based only on the basis of that particular workstation while the global priority rules considers the other stations as well through which the job has to pass through to make sure that it is done on time.

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Commonly Used Priorities Rules

- First come, first served (FCFS) ✓
- Last come, first served (LCFS) ✓||
- Earliest due date (EDD) ✓
- Shortest processing time (SPT) ⚡
- Longest processing time (LPT) ⚡
- Critical ratio (CR):
 - $(\text{Time until due date}) / (\text{processing time})$





Now we will see what are the various rules. We have already talked about the various rules like the First Come First Serve or there is unique one, the Last Come First Serve. The order

which is coming up or the customer which is coming at the last is given the top priority although it is not that consider to be that good because people show lot of resentment about this, especially in the service industry.

Then the Earliest Due Date, the order for which the due date is earliest is given the topmost priority, then shortest processing time, the job which needs the minimum time for completion is given the top priority, then the longest prior, longest processing time in this case the job which needs the maximum time is given the top priority and then there is a Critical Ratio.

So, here from now the time for the due date and the processing time, ratio of these two indicates the Critical Ratio. So, it indicates what is the possibility if the job is started immediately then what is the possibility to get it done on time or it will be late, like when CR value is greater than 1 then there is a possibility that the job will be done if it is done, started immediately.

Or it will be done on time when its value is 1 or the job in any case is going to get delayed when the time for due date and the processing time both are such that CR is coming less than 1. So, in this case there will be tardiness. The job will be delayed from the due date.

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Critical Ratio Rule

- $CR = \frac{\text{time remaining}}{\text{work remaining}}$
= $\frac{\text{due date from today}}{\text{processing time from today}}$

If $CR > 1$, job ahead of schedule
If $CR < 1$, job behind schedule
If $CR = 1$, job on schedule

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The definition of the Critical Ratio, as I have said time remaining from the current date for which it has to be due or it will be due and then the work to be done, time remaining and the work remaining, how much time is remaining for the due date and how much time it will take to complete the work.

So, due date from today and processing time from today, these are the things which I have just explained. When CR, Critical Ratio is greater than 1 job is ahead of the schedule, and when CR is less than 1 job is behind the schedule and it is just on the time when CR value is equal to 1.

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Sequencing Jobs Through One Process

- Make-span *make-span*
 - time for a group of jobs to be completed
- Tardiness
 - difference between job's due date and its completion time

Handwritten notes:
 For Make-span: A sequence of jobs A, B, C, D with a total time of 18. A diagram shows A and B in a sequence, with C and D below them, and a total time of 18 indicated by an arrow.
 For Tardiness: A calculation $24 - 20 = 4$ with the result 4 circled and the word "Lati." written below it.

When these rules are applied for sequencing of the different jobs which are to be passed through a particular machine or plant or facility it takes, it takes the different time values, the kind of effectiveness with regards to the time becomes different when the different rules are applied for same set of the jobs.

So, there is one term which is, which is like the Make-span time. Like say 4 jobs are waiting to be completed A, B, C, D and so whatever the rule is applied, whether we are starting from the A and then finishing with the D or starting with the C first, B second, A third and D fourth, whatever sequence is followed, how much time it takes to complete the entire group of the jobs, say as per one rule it may take, when the one sequencing rule is applied, it may take 18 days when another sequencing rule is applied it may take different set of the time for the group of the jobs to be completed.

And the Tardiness, it is about the amount by which the job has been delayed from the due date say the due date, so it is the difference between the job's due date and its completion time. If the completion time is, it is time to complete the job has been 24 and the due date from today was say, 20 then the tardiness will be 4. So, this is the magnitude by which the job

has become late. So, whenever there is tardiness means the job has certainly been delayed by certain time.

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Measuring Performance

- Job flow time:
 - Avg. flow time measures responsiveness ✓
- Average # jobs in system:
 - Measures amount of work-in-progress; avg. # measures responsiveness and work-in-process inventory
- Makespan: ✓
 - The time it takes to finish a batch of jobs; measure of efficiency
- Job lateness: ✓
 - Whether the job is completed ahead of, on, or behind schedule; ✓ ✓ ✓ ✓ ✓
- Job tardiness:
 - How long after the due date a job was completed, measures due date performance ✓
Customer service ✓

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There are other parameters which indicate the performance of these various rules, like the job flow time. The average job flow time indicates the responsiveness of the system. So, if there are many jobs which are to be processed through a plant or through the facility so what is the average time for completion of all these jobs which includes the waiting time and the processing time.

So, how fast the jobs are done, how quick the completion of the jobs are done, that is indicated with the help of the average flow time. Then the average number of the jobs in the system per day so it measures the, that kind of amount of work which is there in progress, it so work in progress and the responsiveness of the system is indicated by the average number of the jobs in the system.

As I have just explained the Make-span, it is the time that it takes to complete a batch of the jobs which indicates the efficiency of the plant or of the machine as a whole, then the job lateness, whether the job has been completed on time or it is late or it has been done before, that is indicated by the lateness, so lateness not necessarily it has been delayed from the due date but it may be ahead, it may be on time or it may be behind the schedule.

But in case of the tardiness certainly how long after the due date the job was completed, it may just the date performance to the customer. So, it is also an indicative of the customer service. Greater the tardiness, greater the number of the jobs having the tardiness, greater the

percentage of the jobs which are having the tardiness, greater the average value by which the jobs are delayed, so all those parameters can be calculated which will be indicating the customer service performance of that particular rule.

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Sequencing Rule Example

Job	Processing Time	Due Date	Slack	Critical Ratio
A	5	10	$(10 - 5) = 5$	$(10) / 5 = 2$
B	10	15	$(15 - 10) = 5$	$(15) / 10 = 1.5$
C	2	5	$(5 - 2) = 3$	$(5) / 2 = 2.5$
D	8	12	$(12 - 8) = 4$	$(12) / 8 = 1.5$
E	6	8	$(8 - 6) = 2$	$(8) / 6 = 1.33$

Handwritten notes on the slide: FCFS, SPT, EDD, CR, DD-PT, PT.

Now, we will see particular example when given case is there, say 5 jobs are to be done this job A, B, C, D and E. The time for processing in days, say 5 days for A job, 10 days for the B job, 2 days for C job, and D it takes 8 days and E 6 days. And corresponding, the due date for A is 10 days, 15 days for B, 5 days for C, 12 days for D and 8 days for the E.

So, now we have these are the various ways like Least Slackness, the Critical Ratio, Due Date, processing time, so SPT is the kind of the rule or the Earliest Due Date is the another rule, least slackness is another rule. Critical Ratio is another rule. Or the order in which jobs are coming, that is the another rule, like First Come First Serve.

So, say this is the order in which, or this is the sequence in which the jobs arrived for a particular plant or a particular machine. Then these things are very clear and nothing is to be calculated but to calculate the slackness what we have to do is slackness is calculated from the time from processing and the due date.

So like say, the difference of the due date and the processing time that us gives the slackness. So, the slackness for, slackness for the job A is 10 minus 5 is 5, for B 15 minus 10, 5 for C it is 3 days, and for job D it is 4 days like 12 minus 8, and for the job E so this is the like say, this is the due date from today and this is the processing time.

So the difference of this will indicate when the slackness is more, means there is some flexibility, some cushioning effect by which the job can, even if the job is not done it will not be delayed. So the least slackness means there is just the gap of the 2 days. If the job is not started in 2 days because the processing time here is 6 days and the due date is after 8 days so the time slackness is of just 2 days. If the job is not started in 2 days then it will be delayed and that is why the Least Slack Rule is applied.

Least Slack Rule is applied, whenever it is applied we consider the job which is having the least slackness is given the top priority while the jobs having the lesser slackness or higher slackness, those will be given the lesser priority because there will be fewer chances for them to get delayed and the job having the minimum slackness that will have the maximum chance to get delayed. So, that is why it will be given the maximum priority or the top priority.

Now, coming to the Critical Ratio the similar to the slackness, the Critical Ratio is also of the similar kind because it considers the ratio of the due date from today and the processing time. So, when the two are equal means let us say if the processing time is 5 days and the due date is also 5 from today, then we need, if we start immediately then it will be done on time otherwise there will be tendency to get delayed.

So, this ratio also indicates the similar kind of thing. So, the Critical Ratio when calculated for A that is the 10 due date from today and the processing time is 5 so here the 2, Critical Ratio 2 and for B it is 1.5, for C 2.5, and for D 1.5, and for E. So, greater the Critical Ratio lesser will be the chances for the delaying and lesser is the Critical Ratio, lower is the Critical Ratio value greater will be the tendency for getting delayed. So, the jobs having the lower Critical Ratio, they will be given the top priority.

Now, through the different rules we will see that for all these cases, means for this case where we are having 5 jobs, the given processing time and given due date for which we have calculated slackness and the Critical Ratio, what will be the effectiveness of the different rules with regard to the tardiness, the number of jobs which are tardy, the flow time, the time they take to complete the jobs etc. So, we will be starting with the First Come First Serve. Assuming that the job A arrived first and the job then B, then C, then D and then E.

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First-Come First-Served

Job	Processing Time	Due Date
A	5	10
B	10	15
C	2	5
D	8	12
E	6	8

Sequence	Start Time	Processing Time	Completion /Flow Time	Due Date	Tardiness
A	0	5	5	10	0
B	5	10	15	15	0
C	15	2	17	5	12
D	17	8	25	12	13
E	25	6	31	8	23
Average			$93/5 = 18.60$		$48/5 = 9.6$

WT+PT

And assuming that, like say this is the same case that we have taken up, the job A, B, C, D, E and the corresponding processing time 5 days, 10 days, 2 days, 8 days and 6 days and the due date from today 10, 15, 5, 12 and 8. Now, considering that and this is the order in which the jobs arrived, so they are kept in the same order.

Now, so if the job is started immediately because it is First Come First Serve approach then the job is started immediately. So, we are starting the processing of the job A so initially the start time is 0 then processing time 5 days and then it will be completed in 5 days because we are starting with the first day. Then after the job, completion of the job A in 5 days we will be starting the next job B so processing time for B job is 10 days, so it will be completed in 15 days.

After 15 days the next job is C. The processing time for C is 2 days so it will be completed in 17 days. So, flow time or completion time is here. Waiting time plus the processing time or the job time, for which the job is done. After 17 days the next job is taken up D, processing time for the D is 8 so it is completed after the 25 days and then after 25 days the next, so after waiting of the 25 days the job E is taken up and processing time for job E is 6 so it will be completed after 31 days.

Flow time of all these jobs will be 93, 5 plus 15 plus 17 plus 25 plus 31, this is coming 93 is the total flow time for all these jobs and average flow time or average completion time will be like 18.6. Then we have to calculate now the tardiness or the lateness. So, the tardiness, we

know that the flow time is the time by which the job is completed. So, the first job is completed after 5 days while the due date is 10.

So, the tardiness is here, in that case the lateness will be minus 5 so the tardiness is 0 and here the job B is completed after 15 days. Due date is also 15 so the difference of the two will be giving 0. The C job is completed after 17 days. Due date was 5, after 5 days so the difference of 2 will be giving tardiness of the 12 days. The job D is completed after 25 days while the due date was 12. So, the difference of the two will be giving the tardiness of the 13. Likewise 31, job E is completed after 31 days. The due date was 8 so the tardiness of the 23 days.

Total tardiness is of 48 days and average tardiness will be coming out 9.6. So, these are the two, like say average flow time and the average tardiness are the two parameters which will be indicating the effectiveness. This is indicating the customer service and this is indicating the, like the work system efficiency or the efficiency of the work system.

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Earliest Due Date

Job	Processing Time	Due Date
A ✓	5	10
B ✓	10	15
C ✓	2	5
D ✓	8	12
E ✓	6	8

Sequence	Start Time	Processing Time	Completion /Flow Time	Due Date	Tardiness
✓ C ✓	0	2 ✓	2 ✓	5	0 ✓
E ✓	2	6 ✓	8 ✓	8	0 ✓
A ✓	8	5 ✓	13 ✓	10 ✓	3 ✓
D ✓	13	8 ✓	21 ✓	12 ✓	9 ✓
B ✓	21	10 ✓	31 ✓	15 ✓	16 ✓
Average					$\checkmark 75/5=15 \checkmark$ $\checkmark 28/5=5.6 \checkmark$

(5.6)

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First-Come First-Served

Job	Processing Time	Due Date
A	5	10
B	10	15
C	2	5
D	8	12
E	6	8

Sequence	Start Time	Processing Time	Completion /Flow Time	Due Date	Tardiness
A	0	5	5	10	0
B	5	10	15	15	0
C	15	2	17	5	12
D	17	8	25	12	13
E	25	6	31	8	23
Average			$93/5 = 18.60$	$48/5 = 9.6$	

Now if we apply another rule for the same case where the job A, B, C, D and E with the processing time and the due dates. So, when the due date rule is applied, Earliest Due Date rule is applied then the topmost priority is given for the job which has the maximum, or which has the Earliest Due Date.

So, Earliest Due Date is for this job C having the 5 days, 5 is the Earliest Due Date. Then the next job is E so we will be giving the second priority to the job and E having the 8 due days. Then the next is, third priority is given to the A having the 10 due days. Then fourth priority is given to the job having the 12 due days.

And the last priority which is having the maximum due days will be given the fifth priority and in this sequence only the jobs will be arranged. Like the first job will be C then the second job will be E, then the third job will be A, fourth job will be D and the fifth job will be B. So, here this is B.

Now, we have to calculate the processing time for the C 2 days, for E 6 days, for A 5 days, for D 8 days and for B it was 10 days. So, that was the processing time. So, the job since the topmost priority has been given to the C, so the C is taken up first and it will be completed in 2 days with the 0 waiting time.

After the 2 days of the completion, the next job E is taken up and its processing time for E is 6 days. So, it is completed in 8 days. Then after 8 days the A job is taken. It takes 5 days to process. So, the job A is completed after 13 days. Thereafter the job D is taken which takes 8 days and then it is completed in 21 days. After 21 days waiting the job B is taken up which

needs processing time of the 10 days and then it is completed in 31 days. So, sum of all these will be giving us the total flow time 75 days and average flow time will be 15 days.

So, in earlier case it was 18.6 when First Come First Serve rule was applied and now it is coming 15 days average flow time. And now with respect to the due date when we consider the tardiness, since so the job A, job C completed just after 2 days while the due date was 5 so it is difference of these two will be negative like 2 minus 5 will be negative, so the tardiness is 0, 8 days is the completion time for the job E, due date is also 8, so here the difference of these two will be 0.

The job A is completed after 13 days and due date is 10 so there will be tardiness of the 3. Likewise the job D is completed after 21 days. Due date was 15, sorry 12 so the tardiness will be 9. And the job B, job B was completed after 31 days, due date was 15. So, the tardiness of the, tardiness is of the 16, difference of 31 and 15.

So, the total tardiness in all 5 jobs here, if we see in earlier case also we had the, in earlier case also we had the 2 jobs without tardiness and only 3 jobs had tardiness. In this case also we have the 2 jobs without tardiness and but the total tardiness has been reduced. Here now it is 28 divide by 5 so 5.6 will be the average tardiness of all these jobs.

It has been reduced significantly as compared to the last, as compared to the same jobs when the First Come First Serve rule was applied. Average tardiness was 9.6 and when the Earliest Due Date rule is applied we can see that it is more effective with regard to the average tardiness and also effective with regard to the average flow time, so both have been reduced significantly while the same jobs are done.

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Least Slack

Job	Processing Time	Due Date	Slack
A	5	10	(10-5) = 5
B	10	15	(15-10) = 5
C	2	5	(5-2) = 3
D	8	12	(12-8) = 4
E	6	8	(8-6) = 2

Slack for each job A - 5, B - 5, C - 3, D - 4, E - 2

Sequence	Start Time	Processing Time	Completion /Flow Time	Due Date	Tardiness
E	0	6	6	8	0
C	6	2	8	5	3
D	8	8	16	12	4
A	16	5	21	10	11
B	21	10	31	15	16
Average		$\checkmark 82/5 = 16.40$		6.8	

FCFS
EDD

Now the Least Slack Rule is applied. So, we know that earlier we had calculated for all these jobs what we have done, A, B, C, D and E jobs same processing time, same due date but we calculated the slackness. So, slackness calculated was like 5 for A, 5 for B, 3 for C, 4 for D and 2 for E. So, since we are considering the Least Slackness Rule so the top priority is given to the job having the least slackness.

So, the least slackness is there with the E, then the next higher least slackness is with the C. So, the second priority is given to this. Then the next one will be 4 and 5, so we can give like the A is given say the fourth, and the B is given the fifth priority and accordingly we put them in sequence. So, A having the least slackness then the C then D, D has got 4 and A and B. And the processing times are same, like processing time for E is 6, processing time for C is 2, processing time for D is 8, processing time for A is 5 and then processing time for B is 21.

So, from the processing time, since the top priority has been given to the least slack job E and therefore it will be started immediately and it will be completed also in 6 days because 6 days is the processing time for this, then after the waiting of the 6 days the job C will be started and it will be completed in 8 days so the 6 plus 2, 8.

The job D after waiting of the 8 days is started and it is completed in 8 days so the flow time is 16. Then after waiting of the 16 days A job is started and it is completed in 5 days so the flow time becomes 21. And after waiting of the 21 days the B job is started and it takes 10 days so the flow time is 31. So, here the sum of all these flow times coming out 82, average flow time is 16.4. It is higher than the, that we observed in case of the Earliest Due Date case.

Now, if we see the tardiness, the tardiness is about the difference of the flow time and the due date. So, the flow time here, the completion time is 6 and due date is 8 so the job is being done early. Tardiness is nil. Here the job is done after 8 days but, and the due date is after 5 days so the tardiness is of 3 days.

The job is done after here, in this case, after 16 days and the due date is 12 so the tardiness is of 4 days. Likewise tardiness for the job A is 21 minus 10, 11 days and for job B, 31 minus 15 days, 16. So, that is how we get that. In this case if we compare in the last 2 cases where we used the First Come First Serve and the Earliest Due Date rules we found that the 2 jobs had nil tardiness.

But in this case now we have just 1 job which is having the nil tardiness while the number of jobs having tardiness has increased. So, it is not that good. And also the average tardiness also has increased.

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Earliest Due Date

Job	Processing Time	Due Date
A ✓	5	10
B ✓	10	15
C ✓	2	5
D ✓	8	12
E ✓	6	8

Sequence	Start Time	Processing Time	Completion /Flow Time	Due Date	Tardiness
✓ C ✓	0	2 ✓	2 ✓	5	0 ✓
E ✓	2	6 ✓	8 ✓	8	0 ✓
A ✓	8	5 ✓	13 ✓	10	3 =
D ✓	13	8 ✓	21 ✓	12	9 ✓
B ✓	21	10 ✓	31 ✓	15	16 ✓
Average					$\checkmark 75/5=15 \checkmark \checkmark$ $\checkmark 28/5=5.6 \checkmark \checkmark$

(5.6)

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Least Slack

Job	Processing Time	Due Date	Slack
A	5	10	(10-5) = 5
B	10	15	(15-10) = 5
C	2	5	(5-2) = 3
D	8	12	(12-8) = 4
E	6	8	(8-6) = 2

Slack for each job A - 5, B - 5, C - 3, D - 4, E - 2

Sequence	Start Time	Processing Time	Completion / Flow Time	Due Date	Tardiness
E	0	6	6	8	0
C	6	2	8	5	3
D	8	8	16	12	4
A	16	5	21	10	11
B	21	10	31	15	16
Average					$82/5 = 16.40$

FCFS ED? 6.8

Earlier in case, in the earlier case this was the case where the 2 jobs have no tardiness and the average tardiness was 5.6. And here in this case it is 6.8 while the number of jobs having the tardiness, means the number of jobs which have crossed the due date is 4, so this is not that good rule as compared to that Earliest Due Date.

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Critical Ratio

Job	Processing Time	Due Date	Slack	Critical Ratio
A	5	10	(10-5) = 5	(10)/5 = 2
B	10	15	(15-10) = 5	(15)/10 = 1.5
C	2	5	(5-2) = 3	(5)/2 = 2.5
D	8	12	(12-8) = 4	(12)/8 = 1.5
E	6	8	(8-6) = 2	(8)/6 = 1.33

CR for each job A - 2, B - 1.5, C - 2.5, D - 1.5, E - 1.33

Sequence	Start Time	Processing Time	Completion / Flow Time	Due Date	Tardiness
E	0	6	6	8	0
D	6	8	14	12	2
B	14	10	24	15	9
A	24	5	29	10	19
C	29	2	31	5	26
Average					$104/5 = 20.8$ $56/5 = 11.2$

The Critical Ratio rule when it is applied, Critical Ratio as we have already calculated for the different jobs A, B, C, D, E processing time, their due dates, the slackness and the Critical Ratio that we have already calculated earlier, for job A 2, for job B 1.5, for job C 2.5, for job D 1.5 and job E 1.33. So, the job having the minimum Critical Ratio will be given the highest priority because that will be leading to the, that will be having the maximum chances of the getting delayed if the job is not started on time.

So, the maximum priority is given to the job E so here the job E is given because of the minimum Critical Ratio the job 1, job E is given the top priority, then the job, then we have the job D second priority, then the job B also can, is having 1.5, so third priority because the two are having the similar Critical Ratio.

So, the one which is having the lower processing time is taken first that is, that can be one of the parameter. Then the next higher Critical Ratio is for A job having the 2 Critical Ratio so fourth priority and the highest priority is given, the highest Critical Ratio is 2.5 for the job C. So, accordingly the sequencing will be done, the E, the top priority, then the job D then the job B, then A and then C. We know that processing time for job E is 6 days, as this, processing time for D is 8, processing time for B is 10, processing time for A is 5, and processing time for C is 2, is this.

Now, since the job E has been given the highest priority so it will be started immediately and it will be completed after 6 days. So, the waiting time is 0, start time is 0 for this but the job D will be started after waiting of 6 days and it will take 8 days so it will be completed after 14 days.

Likewise after B will be taken up after 14 days and it will be completed after 24 days, after 10 days processing time. The job A will be taken up after waiting of 24 days and it will be, it has the processing time of 5 so it will be completed in 29 days. After waiting of the 29 days the job C is taken up and it has the processing time of 2 days. So, the job is completed in 31 days.

So, if you see sum of all these flow times is 104 and average flow time here is the highest so for that is what we have seen, it is 20.8. And on the other hand if we see the tardiness also, the difference of the flow time, here it is being finished earlier than the due date. Due date is 8 and the completion time is 6 so the tardiness is 0.

Here the job D is being completed in 14 days while the due date is 12, so the tardiness of 2, the job B having the completion time of 24 days while the due date is 15, so the tardiness of 9 days. The job A is completed after 29 days while the due date is 10, so the tardiness of 29, and likewise 31 is the flow time or the completion time for the job C while the due date is 5 so huge tardiness is there. Sum of all these is also 56 by 5 and it is also leading to the highest value of the tardiness. So, this has been worst so far as far the completion time and the tardiness is concerned.

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Shortest Processing Time

Job	Processing Time	Due Date	Slack	Critical Ratio
A	5	10	$(10-5) = 5$	$(10)/5 = 2$
B	10	15	$(15-10) = 5$	$(15)/10 = 1.5$
C	2	5	$(5-2) = 3$	$(5)/2 = 2.5$
D	8	12	$(12-8) = 4$	$(12)/8 = 1.5$
E	6	8	$(8-6) = 2$	$(8)/6 = 1.33$

Sequence	Start Time	Processing Time	Completion Time	Due Date	Tardiness
C	0	2	2	5	0
A	2	5	7	10	0
E	7	6	13	8	5
D	13	8	21	12	9
B	21	10	31	15	16
Average					

$74/5 = 14.80$ $30/5 = 6$

FDD
 $\frac{30}{5} = 6$

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So, now we will see likewise the Shortest Processing Time rule can also be applied and what we will see on consideration of the things in the same, the topmost priority is given to the job which is having the minimum processing time. So, the minimum processing time is C giving the one, top priority then the A is given the second highest, third is E, then we have fourth is D and the fifth is B.

So, this is how, this is the order and now again in the same way we will be calculating the processing time, completion time and the tardiness. So, what we are getting here average flow time for this rule is coming 14.8 which is minimum so far what we have calculated and the tardiness is 6, it is the second highest because minimum was for one of the case when we considered the Earliest Due Date that was like 5.6.

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Summary

Rule	Average Completion Time	Average Tardiness	No. of Jobs Tardy	Maximum Tardiness
FCFS	18.60	9.6	3	23
EDD	15.00	5.6	3	16
SLACK	16.40	6.8	4	16
CR	20.80	11.2	4	26
SPT	14.80	6.0	3	16

* best values

So, now comparison of all these rules will be done here. Like First Come First Serve completion time was 18.6, average tardiness 9.6. The number of jobs that and the maximum tardiness was this one. So, here we will be focusing on these two, so for the Earliest Due Date the average flow time, the average flow time or completion time 15, average tardiness is 5.6.

So, this is one combination where it is like the average completion time is also the second lowest and the lowest is the average tardiness. The another one is the minimum, for Shortest Processing Time, minimum is the average completion time were the second highest is the average tardiness. So, these two rules can be chosen suitably as per the relative importance of the, like the system efficiency or the customer service or the customer satisfaction in mind.

Now, I will summarize this presentation. In this presentation basically I have talked about the meaning of the various performance parameters which are used as indicators of the suitability of the various priority sequencing rule and also for one example when the different priority sequencing rules are applied how these performance parameters are affected like the average completion time, average tardiness, number of jobs having tardiness or the average tardiness. Thank you for your attention.