4E1 Management for Engineers:Case Study

Submitted by- Yash Pandey
17317629
D-stream

Project objective -

The objective of this project is to develop a handheld electronic medical reference guide which is to be used by medical technicians and paramedics as a quick reference guide in emergency situations. Thirty units are to be developed by 25th of october for MedCon. It is very essential for the critical success that the project is completed on time.
The project objective should be in accordance with the stakeholders-

Design engineer- it the the responsibility of the design engineer to design and develop this device, so he/she needs to be consulted in order to discuss the resources needed.

Design team- they are the starting point of this project o they need to act quickly.

Medical technicians and paramedics- They are the end users of this device so they need to provide design team every information about how they want this device to be like.

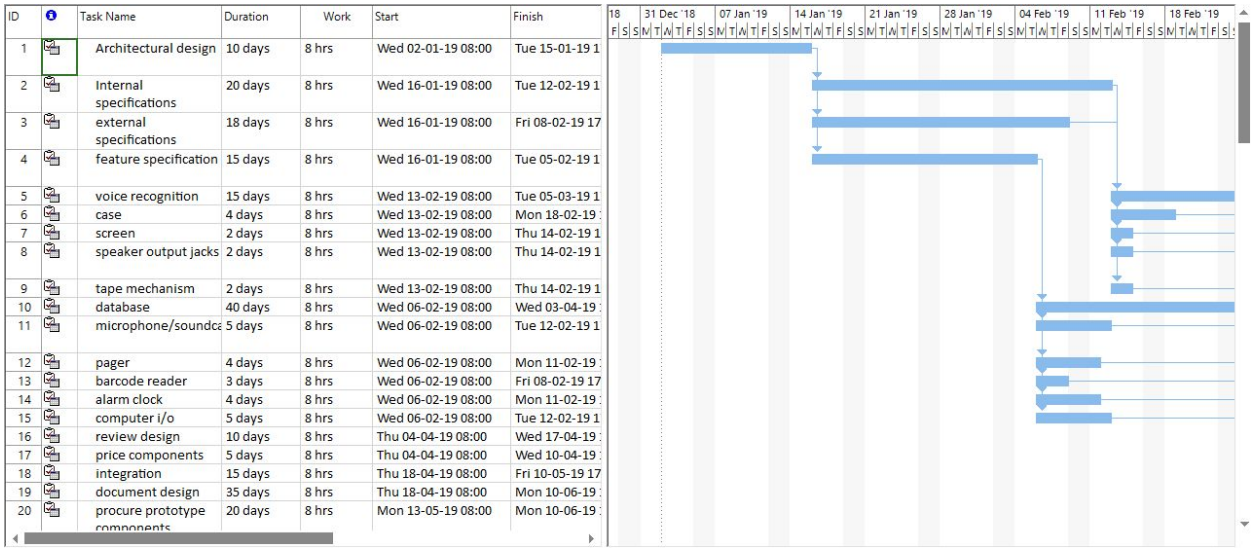
Investors- the budget of the project is largely decided by the investor. It is very essential that the the investor is also consulted before making any change in the budget or time period of the project.

Medical organisations- they should be consulted so that the device developed does not break any medical protocol that might harm a person in emergency.

The time is the constraint, scope of the project can be accepted and cost can be enhanced.
Time - it is very important that we meet the deadline that is 25th october so time is constraint.
Scope- the product is already well designed so the scope of the project can be accepted and there is no change needed.
Cost- Cost can be enhanced, we can reduce the cost and still finish the project in same time and scope.

	Time	Scope	Cost
Constraint	$$$$$$$		
Accepted		$$$$$$$	
Enhanced			$$$$$$$

Gantt Chart Initial-



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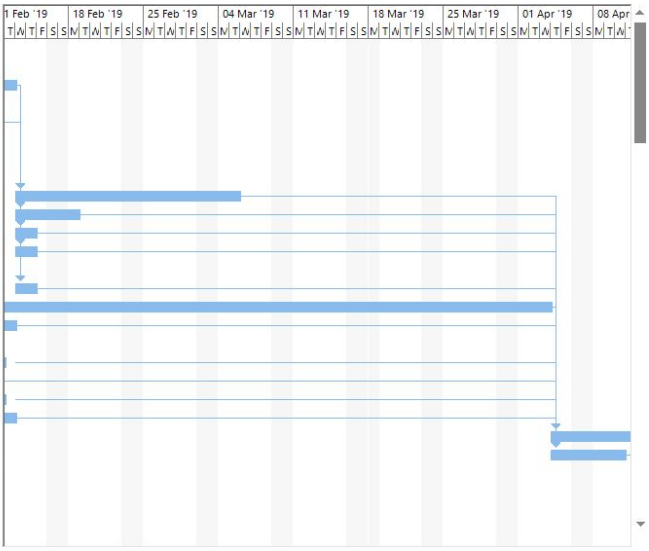

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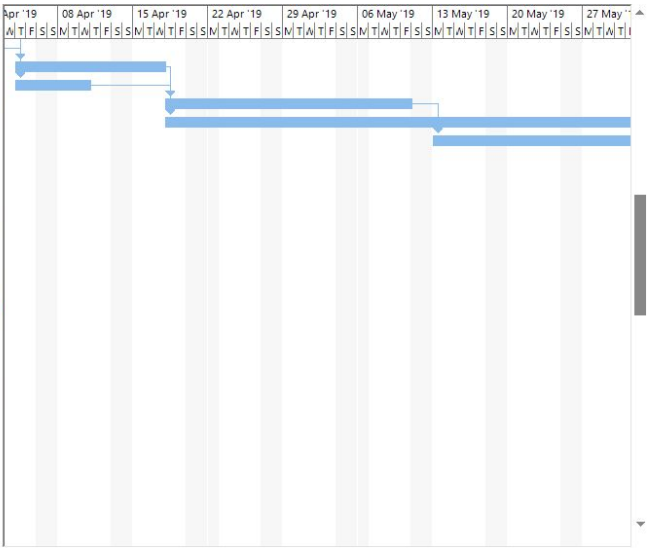

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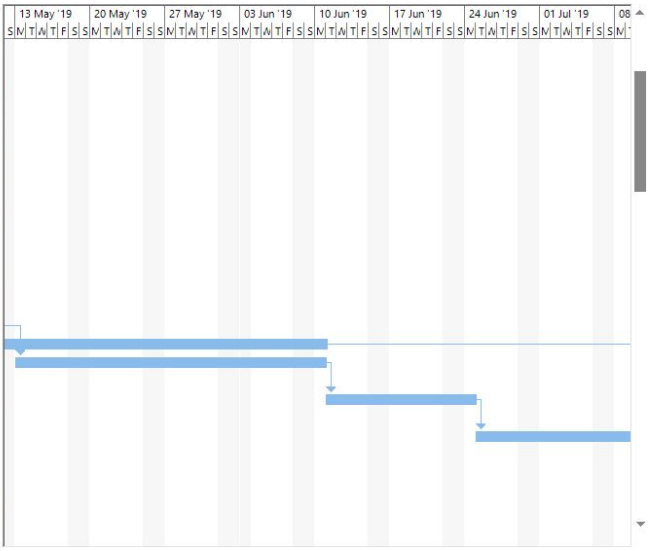

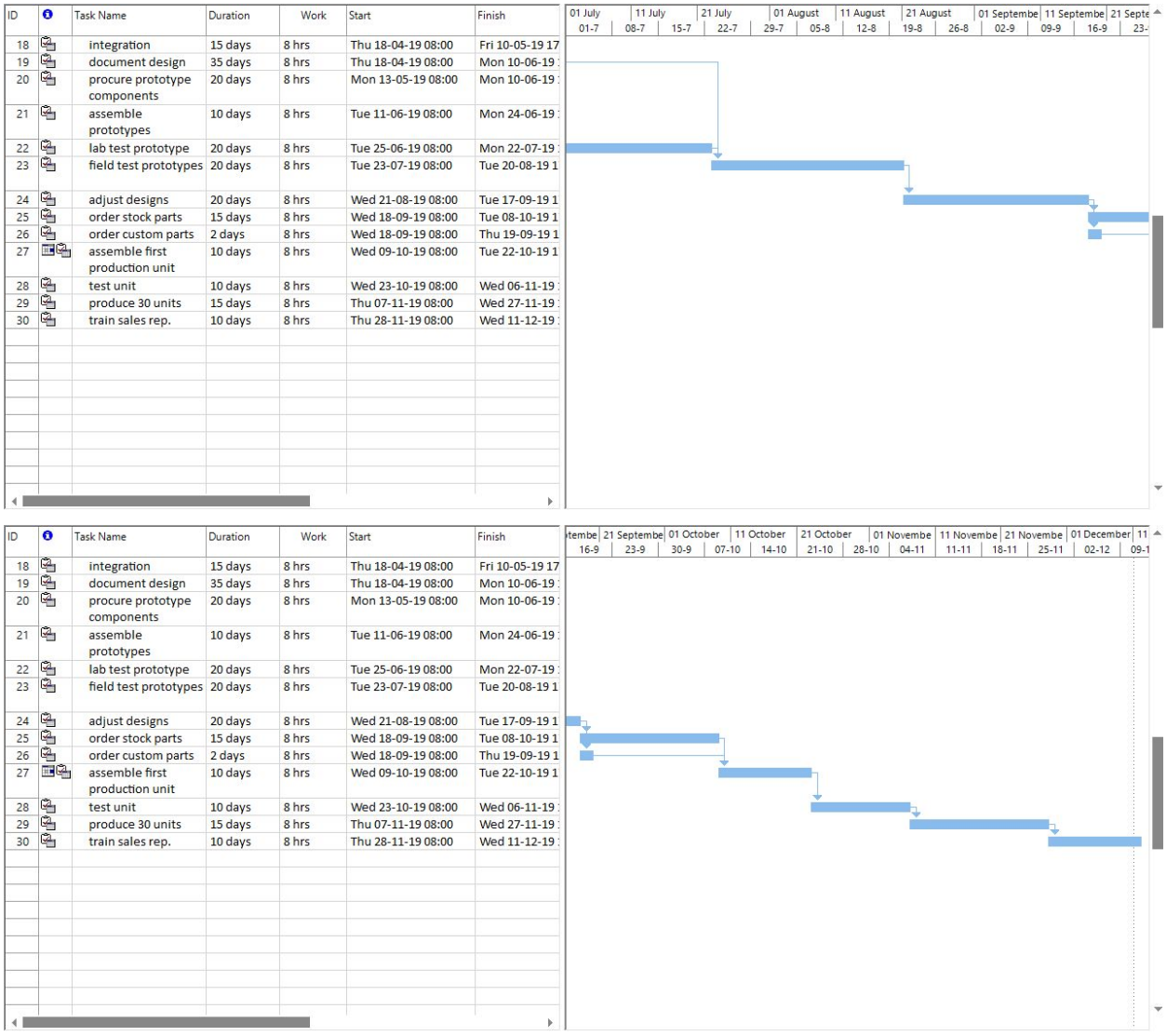

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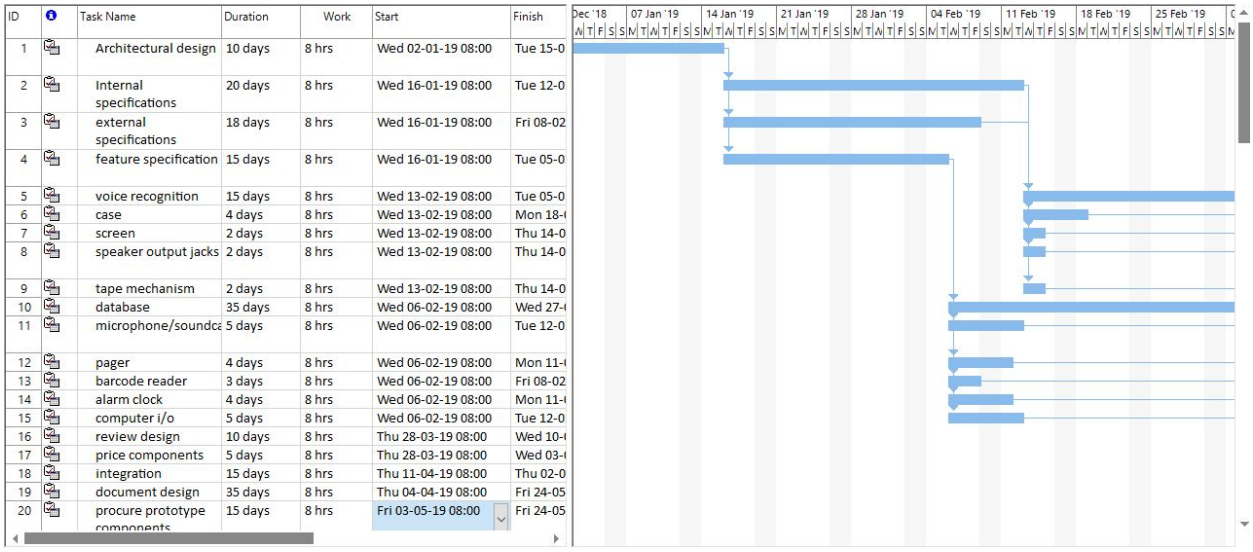
If the original schedule is followed the results are very disappointing as the project overshots the deadline by nearly a month. The chart predicts that the project would be completed in the first week of December if the things go smoothly as planned without any interferences. Sunday and Saturday is considered to be non working days. Apart from the weekends, there are several holidays included in the calendar. The normal working shifts are from eight to twelve in the morning and then after a hour break from one to 5 in the evening that is normal shifts are 8 hours long. Working overtime is not allowed. Duration of the task, name of the task and predecessors were considered while developing this chart.

The project needs to completed in time that is by 25th of october. Time is a constraint whereas cost can be enhanced. To meet our deadline duration of some of the activities on the critical path can be reduced.

Gantt Chart after changing original schedule-



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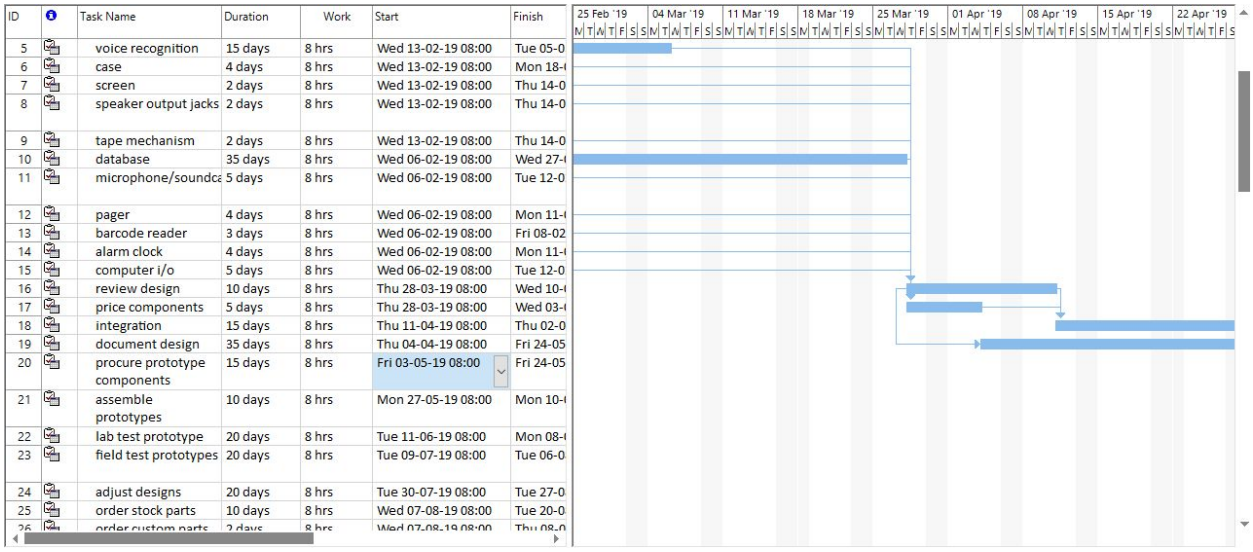

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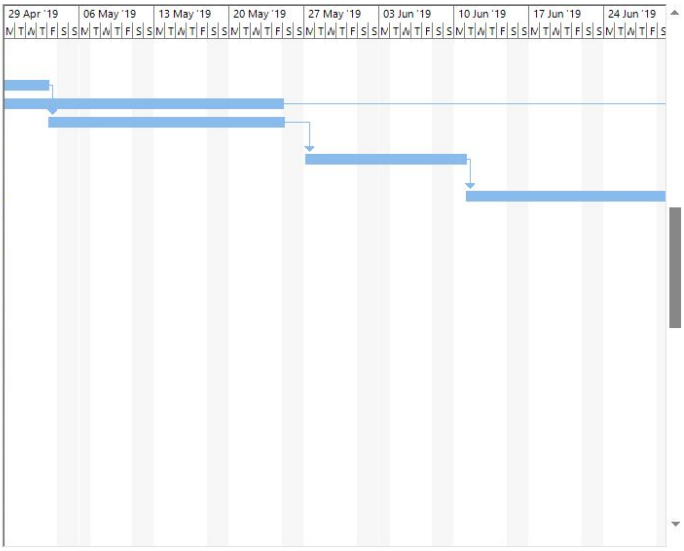

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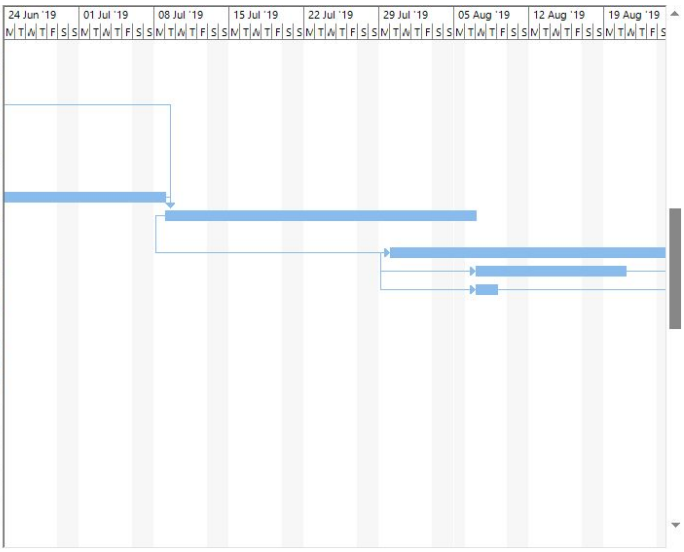

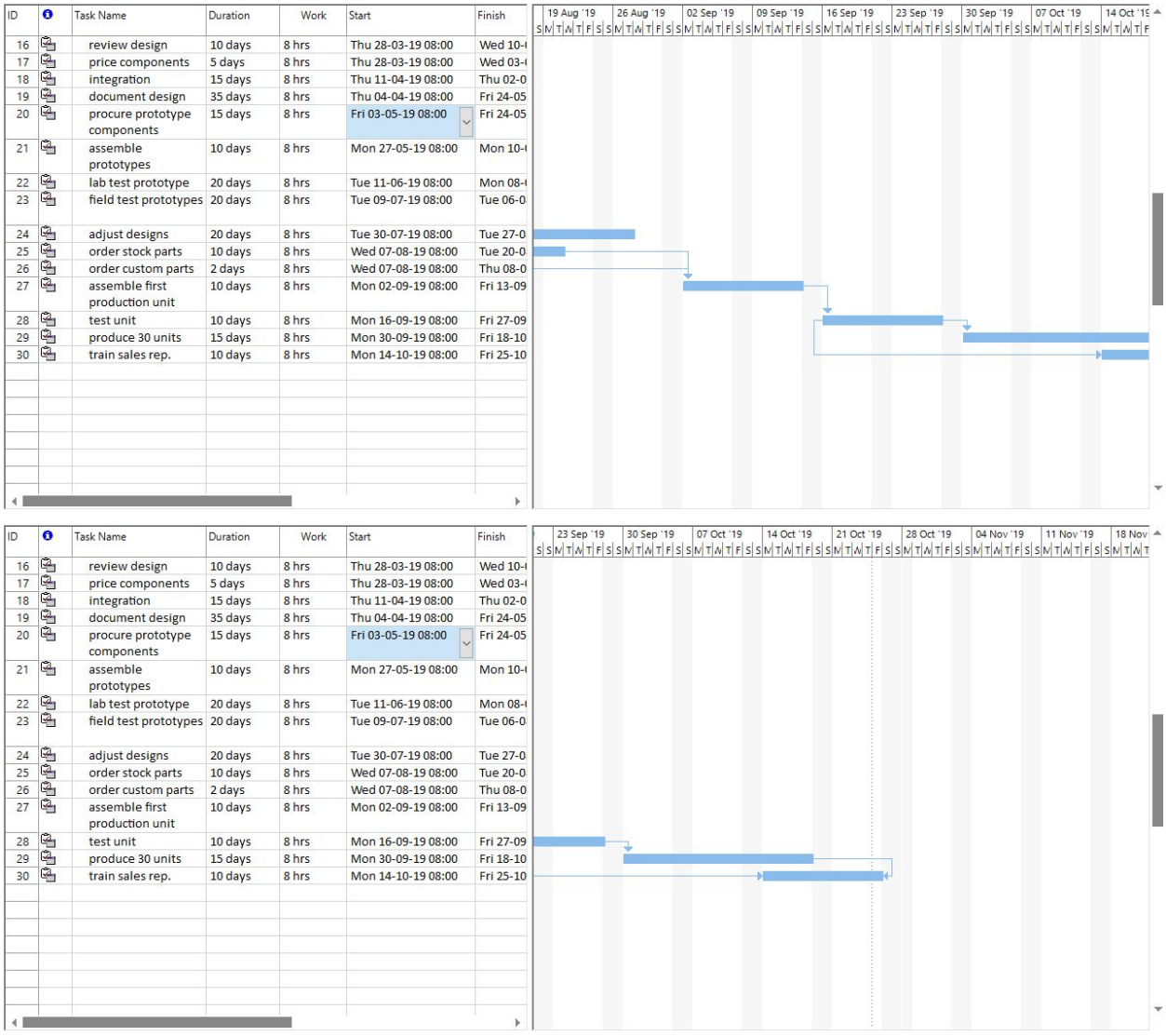

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29	produce 30 units	15 days	8 hrs	Mon 30-09-19 08:00	Fri 18-10
30	train sales rep.	10 days	8 hrs	Mon 14-10-19 08:00	Fri 25-10

After the changes were made in the original schedule, it can be clearly seen that the project is now completed on deadline that is 25th of october. Sunday and Saturday is considered to be non working days. Apart from the weekends, there are several holidays included in the calendar. The normal working shifts are from eight to twelve in the morning and then after a hour break from one to 5 in the evening that is normal shifts are 8 hours long. Working overtime is not allowed.

The changes made in the original schedule are in two parts.

In the first part, after consulting with the development engineer who pointed out that initially all the relations were finish to start and it is possible to reduce the duration by introducing start to start lags in some relations that is to start some tasks one did not need to wait for all the previous tasks to be fully completed. In accordance with that the following changes were made in the relation ships-

1) Document design began 5 days after the start of the review design.
2) Adjust design began 15 days after the start of field test prototypes.

3) Order stock parts began 5 days after the start of adjust design.
4) Order custom parts began 5 days after the start of adjust design
5) Training sales representatives began 5 days after the start of test unit and completed 5 days after the production of 30 units.

In the second part, a maximum budget of euro 100000 was alloted to reduce the duration of some of the following activities,

Development of voice recognition system could be reduced from 15 days to 10 days at a cost Of €15,000.
Creation of database could be reduced from 40 days to 35 days at a cost of €35,000.
Document design could be reduced from 35 days to 30 days at a cost of €25,000.
External specifications could be reduced from 18 days to 12 days at a cost of €20,000.
Procure prototype components could be reduced from 20 days to 15 days at a cost of €30,000.
Order stock parts could be reduced from 15 days to 10 days at a cost of €20,000.

Out of the options given the following changes were made,

1) Creation of database was reduced from 40 days to 35 days at a cost of €35,000.
2) Procure prototype components was reduced from 20 days to 15 days at a cost of €30,000.
3) Order stock parts was reduced from 15 days to 10 days at a cost of €20,000.

The total cost of these changes was euro 85000 which was less than our given budget.
We made the above changes because there was no free slack in those activities, which can be verified from the table below.

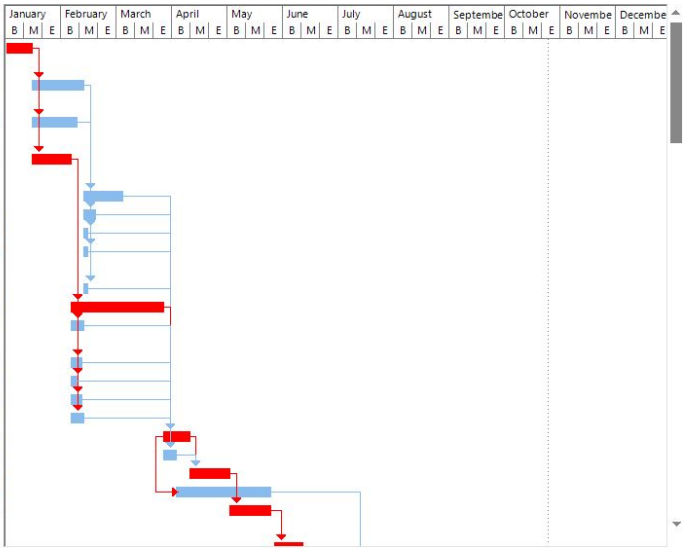
Activity	Free slack
voice recognition	15
database	0
Document design	30
External specifications	17
Procure prototype components	0
Order stock parts	0

This mean by reducing the duration of the above activities we were actually reducing the total duration of the project.

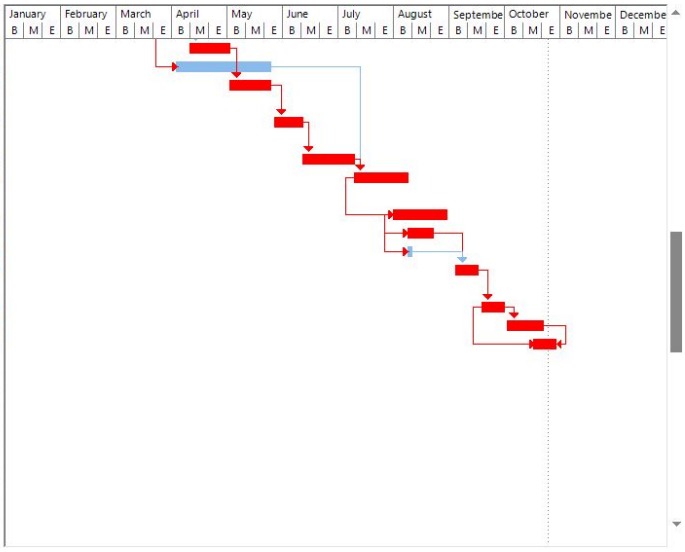
Hence by making all the changes that are mentioned above we were able to meet the deadline of the project.

Critical Path-

ID	Task Name	Duration	Work	Start	Finish
1	Architectural design	10 days	8 hrs	Wed 02-01-19 08:00	Tue 15-0
2	Internal specifications	20 days	8 hrs	Wed 16-01-19 08:00	Tue 12-0
3	external specifications	18 days	8 hrs	Wed 16-01-19 08:00	Fri 08-02
4	feature specification	15 days	8 hrs	Wed 16-01-19 08:00	Tue 05-0
5	voice recognition	15 days	8 hrs	Wed 13-02-19 08:00	Tue 05-0
6	case	4 days	8 hrs	Wed 13-02-19 08:00	Mon 18-(
7	screen	2 days	8 hrs	Wed 13-02-19 08:00	Thu 14-0
8	speaker output jacks	2 days	8 hrs	Wed 13-02-19 08:00	Thu 14-0
9	tape mechanism	2 days	8 hrs	Wed 13-02-19 08:00	Thu 14-0
10	database	35 days	8 hrs	Wed 06-02-19 08:00	Wed 27-(
11	microphone/soundca	5 days	8 hrs	Wed 06-02-19 08:00	Tue 12-0
12	pager	4 days	8 hrs	Wed 06-02-19 08:00	Mon 11-(
13	barcode reader	3 days	8 hrs	Wed 06-02-19 08:00	Fri 08-02
14	alarm clock	4 days	8 hrs	Wed 06-02-19 08:00	Mon 11-(
15	computer i/o	5 days	8 hrs	Wed 06-02-19 08:00	Tue 12-0
16	review design	10 days	8 hrs	Thu 28-03-19 08:00	Wed 10-(
17	price components	5 days	8 hrs	Thu 28-03-19 08:00	Wed 03-(
18	integration	15 days	8 hrs	Thu 11-04-19 08:00	Thu 02-0
19	document design	35 days	8 hrs	Thu 04-04-19 08:00	Fri 24-05
20	procure prototype components	15 days	8 hrs	Fri 03-05-19 08:00	Fri 24-05



ID	Task Name	Duration	Work	Start	Finish
18	integration	15 days	8 hrs	Thu 11-04-19 08:00	Thu 02-0
19	document design	35 days	8 hrs	Thu 04-04-19 08:00	Fri 24-05
20	procure prototype components	15 days	8 hrs	Fri 03-05-19 08:00	Fri 24-05
21	assemble prototypes	10 days	8 hrs	Mon 27-05-19 08:00	Mon 10-(
22	lab test prototype	20 days	8 hrs	Tue 11-06-19 08:00	Mon 08-(
23	field test prototypes	20 days	8 hrs	Tue 09-07-19 08:00	Tue 06-0
24	adjust designs	20 days	8 hrs	Tue 30-07-19 08:00	Tue 27-0
25	order stock parts	10 days	8 hrs	Wed 07-08-19 08:00	Tue 20-0
26	order custom parts	2 days	8 hrs	Wed 07-08-19 08:00	Thu 08-0
27	assemble first production unit	10 days	8 hrs	Mon 02-09-19 08:00	Fri 13-09
28	test unit	10 days	8 hrs	Mon 16-09-19 08:00	Fri 27-09
29	produce 30 units	15 days	8 hrs	Mon 30-09-19 08:00	Fri 18-10
30	train sales rep.	10 days	8 hrs	Mon 14-10-19 08:00	Fri 25-10



Risk Analysis-

The project need to meet its deadline that is 25 th of october, hence there is a very small room for errors which makes this risk analysis even more important. In the table below you can see the probable risks that are involved and their response and contingency plans along with the likelihood of occurrence of that event is from a scale of one to ten, with ten being the most likely to occur and 1 being least likely to occur.

Risk	Response	Contingency plan	Likelihood
Design issues	Should hire employees with high level of skill set	Should have a second design as back up	3
Leaving team members	Should hire new members as soon as possible	Schedule tasks in such a way that less team members does not effect for a couple of weeks	2
Unexpected accident	Should replace old team members with new team members	Trainers should be train new members quickly	5
Delay in delivery of parts	Order from trusted sellers	Do a quick review of all the sellers before the start of project	5
Team members getting sick	Work environment should be checked	All the protocols of a work environment should be strictly followed	2
Insufficient team members	Advertise for jobs	Allow overtime work	2
Bugs in software	Update software	Remove bugs during development stage	8

Bugs in software is the most likely event to occur and also it is very common with new softwares.
This won't affect the duration of the project much because once the bug is identified is not very difficult and time taking to remove that bug, it can be done quickly.

Team dynamics and team building approach-

Rassy brown should follow tuckman's model of team building, this is a very efficient model used for building strong and balanced teams that perform well. The stages of building team are,

1) Forming- this is the first stage of building a team, sa team members are new they don't know each other and also they don't know about their roles as they might be nervous in the beginning. Various ice breaker activities can be organised to build confidence and trust amongst team members amd also they need to be made aware of their respective roles.
2) Storming- this is perhaps the most difficult stage of building a team. There will be many conflicts and opinions will not match among the team members as they are new to their

roles. Several meetings and daily stand ups should be organised so that all the conflicts and difference of opinions can be resolved among team members.

3) Norming- by this time, all the team members will be quite familiar with their roles and most of the conflicts would have been resolved. Their progress should be monitored and to make the bonding between team members strong, meetings can be organised on a regular basis. This will also increase the understand amongst team members.
4) Performing- manager should aim to reach this stage as early as possible as in this stage teams perform at their highest efficiency. The understanding and communication between the team members is great so the conflicts are resolved very quickly. The productivity of the team can be increased and the frequency of the meetings can be reduced.

Communication amongst the team members will be the biggest issue that the manager will face, she can resolve this by organising daily meetings and encouraging team members to participate in as many ice breaker activities as they can. Other problems she might face are new members joining the team, she will need to follow the same process to inculcate new members in the team but it will be faster because old team members can help new team members, also some team members may leave the team due to some unforeseen circumstances to deal with it she would need to hire new team members. She may also get stuck at one particular level for a long time during team building, to deal with this she will need to solve the conflicts in a very calm way and develop trust amongst team members.

Project Report-

The objective of this project is to develop a handheld electronic medical reference guide which is to be used by medical technicians and paramedics as a quick reference guide in emergency situations. Thirty units are to be developed by 25th of october for MedCon. It is very essential for the critical success that the project is completed on time.

The project need to meet its deadline that is 25 th of october, hence there is a very small room for errors which makes this risk analysis even more important. Although most of the events are less likely to happen but we should be prepared for them. The event that is most likely to happen is bugs in software but that can be resolved quickly as we have a highly skilled development engineer and team. Risk analysis is elaborated in the table below.

Risk	Response	Contingency plan	Likelihood
Design issues	Should hire employees with high level of skill set	Should have a second design as back up	3
Leaving team members	Should hire new members as soon as possible	Schedule tasks in such a way that less team members does	2

		not effect for a couple of weeks	
Unexpected accident	Should replace old team members with new team members	Trainers should be train new members quickly	5
Delay in delivery of parts	Order from trusted sellers	Do a quick review of all the sellers before the start of project	5
Team members getting sick	Work environment should be checked	All the protocols of a work environment should be strictly followed	2
Insufficient team members	Advertise for jobs	Allow overtime work	2
Bugs in software	Update software	Remove bugs during development stage	8

Human resource department will be acquiring new team members, they will be managing all the risks involved . Also there is a staff recognition system which will recognise the employee of the month to keep team members motivated throughout.