NEW TECHNIQUE FOR PROJECT DURATION

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***Abstract*—Various companies use project management as a tool to improvise their performance and competitiveness. These projects need various resources to execute the projects. Any project will face various risks before and after completion of the project some of these risks are time and cost risk. To complete the project on schedule time is essential. Failing which may affect the company's reputation and also be heavily penalized. In order to avoid these situation project managers may take adequate steps at the right time to bring the project back on track. This can be done by adding more resource which in turn will affect the budget of the project. This kind of adequate steps taken to reduce the project time by keeping the project cost minimum is called crashing. Few traditional methods which are followed for crashing are CPM/PERT networks these methods will consider only the average activity time for calculating the critical path without considering the uncertainty of the activity duration which may vary due to which the certain paths that have more chance to become a critical path may be avoided. To avoid this situation the stochastic nature of the duration of activities will be stimulated. Including this stochastic duration in this crashing process enables the project distribution time properly and reflects the specific crashing configuration that may have on the projects.**

Keywords—Crashing, Activity cost, Non linear time

I. INTRODUCTION

The diminishing of the duration of the complete project duration at a very minimal additional cost by all means and all methods is crashing. The goal of crashing a project is to compete the project at a specified time using additional resources with less cost. Some cost is directly related to project duration while some are indirectly related to project duration. Our main aim is to find the best way or optimal time will be minimized and minimal cost may be with more resources. Sometimes we use crashing to expedite the project schedule even if the project cost increases; because the alternate may cause more damage to the company an optimal project programming is to obtain optimal project duration in an optimal project cost using a proper tool.

Relationship between Activity Time and Cost

The below fig 4.1 gives a simple representation between the activities duration and its direct cost. Minimizing the activity duration will maximize its direct cost. Time having minimal direct cost is called the normal duration and the finish duration to finish the activity is crash duration, it may have maximum cost. The linear relation inbetween these two gives the intermediate duration to be chosen.

As the duration of the activity is minimized an increase will be there in the direct cost. One simple example is that of the use of overtime in an activity which in turn increases the wage to be paid for that activity. It also affects the quality of the project since overtime work will result to accidents and less quality work. Which in turn will increase the indirect cost also, so a linear relationship cannot be expected between the duration and direct cost, but it may be a convex function.

Relationship between Project time and Cost

The direct cost and indirect cost together posses the project cost. If in a project the activity which costs minimum (normal duration) is chosen then the project duration will be more which in turn will result in penalties on late completion of the project. On the other hand, an activity with minimum possible time may be chosen call the (crash duration), but it may result in maximum cost. The project manager decreases the direct cost. On the other hand indirect cost will decrease and the project time decrease. Thus the indirect cost is almost linear with the project time.

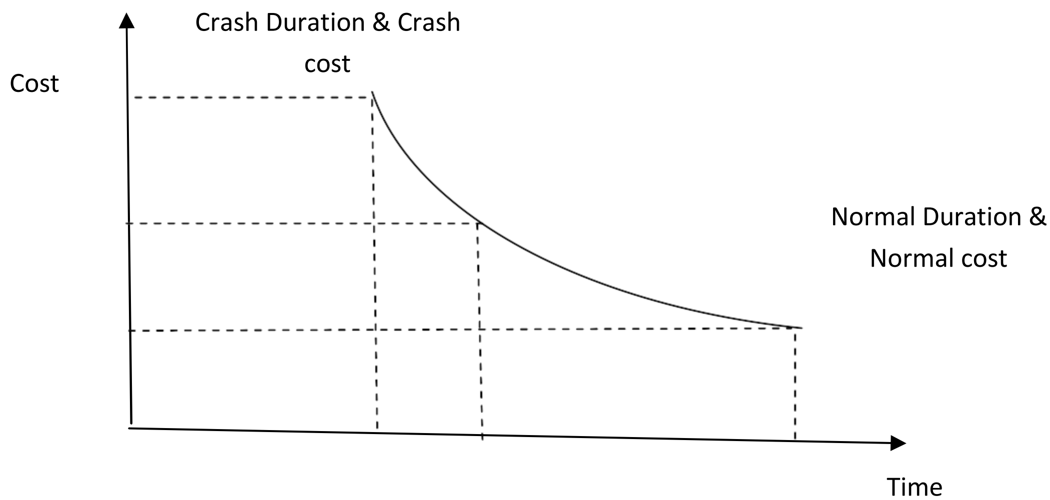

Fig.1 Time and cost linear relation of an activity cost

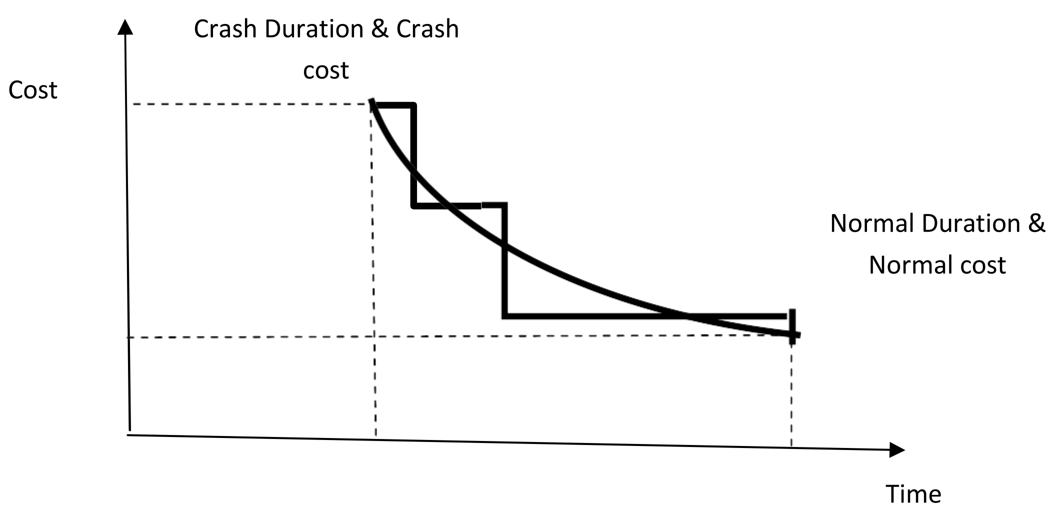

Fig.2 Non-linear time and cost for an activity

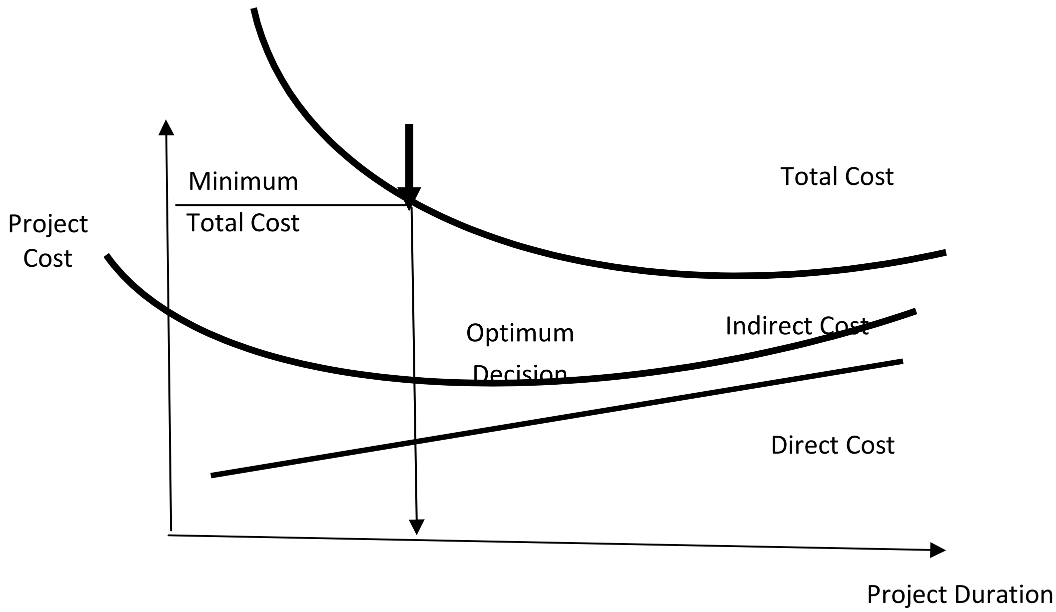

Fig.3 Project cost-time relationship

Crashing Network Approaching steps

1. Select the activity in the critical path (CPM) which has the least slope value.
2. Since project duration depends on critical path choose the critical path
3. The crashing activity has the time reduced in CPM directly dependents of unselected path.
4. The path which is unselected is less than or equal to the selected path at crashing duration.

Example

Normal time, cost and Crash time, cost of the project are given below

Table 1

Activity	NT	NC	CT	CC
A-B	3	300	2	400
B-C	3	30	3	30
B-D	7	420	5	580
B-E	9	720	7	810

C-E	5	250	4	300
D-E	0	0	0	0
E-F	6	320	4	410
F-G	4	400	3	470
F-H	13	780	10	900
G-H	10	1000	9	1200
Total Cost = Rs. 4220				

The indirect cost per week is Rs.50. To determine minimum total time and corresponding cost. Find network of the project and optimum cost and time.

Table 2

Activity	NT	NC	CT	CC	TN-TC	CT-CN	$\frac{TN-TC}{CT-CN}$
A-B	3	300	2	400	1	100	100
B-C	3	30	3	30	0	0	0
B-D	7	420	5	580	2	160	80
B-E	9	720	7	810	2	90	45
C-E	5	250	4	300	1	50	50
D-E	0	0	0	0	0	0	0
E-F	6	320	4	410	2	90	45
F-G	4	400	3	470	1	70	70
F-H	13	780	10	900	3	120	40
G-H	10	1000	9	1200	1	200	200

Network of proposed project

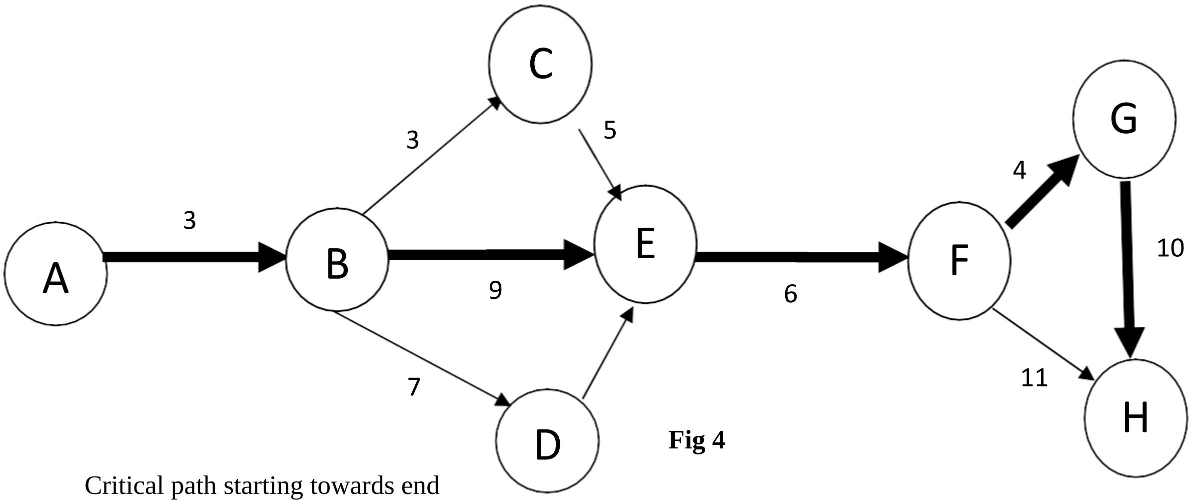

Fig 4

Critical path starting towards end

A – B – C – E – F – G - H = 31 weeks

A – B – E – F – H = 30 weeks

A – B – E – F – G – H = 32 weeks it is critical path (CPM) of the project duration.

Table 3

Crashed Activity	No. Of Weeks Crashed	Weeks saved in project	Project Duration (week)	NDC	Indirect Cost (Ic) Rs.	CC	Total Cost
CPM	-	-	32	4220	32*50=1600	0	5820
B – E	1	1	31	4220	31*50=1550	1*45=45	5815
E – F	2	2	29	4220	29*50=1450	45+2*45=135	5805
F – G	1	1	28	4220	28*50=1400	135+1*70=205	5825
A – B	1	1	27	4220	27*50=1350	205+1*100=305	5875
F – H	2	-	27	4220	27*50=1350	305+2*40=385	5955
G – H	1	1	26	4220	26*50=1300	385+1*200=585	6105
C – E	1	-	26	4220	26*50=1350	585+1*50=635	6155

B – E	1	1	25	4220	25*50=1250	635+1*45=680	6150

The optimum cost is Rs.5805 and optimum duration is 29 weeks and the maximum crashing after the project duration is 25 weeks.

III.RESULT AND CONCLUSION

The activities are crashed giving the least project duration to be 25 weeks and the crashing has been done from 32 to 25 weeks. It is found that crashing every activities in the critical path as per the given conditions will further crash the project to give minimum duration and also crashing the activity not in critical path will not change the project finish time. So they will not be determined

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