

SPREADSHEET MODEL FOR ACTIVITY-ON-NODE PROJECT USING EXCEL EVOLUTIONARY SOLVING METHOD

Jim Chen, Norfolk State University, Virginia, U.S.A.
Bhagaban Panigrahi, Norfolk State University, Virginia, U.S.A.
Mak Khojasteh, Winston-Salem State University, North Carolina, U.S.A.

[dx.doi.org/10.18374/JABE-23-1.3](https://doi.org/10.18374/JABE-23-1.3)

ABSTRACT

The purposes of this paper are threefold. The first is to present a spreadsheet model based on the activity-on-node (AON) network which eliminates forward passing and backward passing processes completely. The second purpose is to show that the Excel Evolutionary solving method is the solving method of choice for project crashing because the Simplex LP and the GRG Nonlinear methods may fail to find the optimal solution because of the use of functions with unsmooth behavior such as MAX() in identifying the critical path. The third purpose is to present the use of vlookup() function to significantly simplify the process of critical path identification.

Keywords: PERT, CPM, Activity-on-Node, Excel Evolutionary Solver, vlookup()

1. INTRODUCTION

Project managers face the task of managing projects that contain uncertain factors. Though Gantt chart can be used to manage simple projects, project managers encounter complex projects from time to time.

Two more sophisticated methods of project management were developed in the 1950s: program evaluation and review technique (PERT) and critical path method (CPM). PERT assumes the activity completion time is probabilistic while CPM assumes the activity completion time is deterministic and the project completion time is the sum of the completion times of the activities along the longest path. Over the years, the two methods have been widely used together.

They are invaluable aids to project planning and control (Kazan, 2005; Davis, 2008, Mantel et. Al, 2011). The proliferation of computer software such as Microsoft Excel Solver and Analytic Solver Platform makes them more valuable than in the past.

Two basic areas a project manager has to address are time and costs. This paper illustrates (1) the construction of a spreadsheet model for an activity-on-node (AON) project constrained by both time and cost, and (2) the use of the Excel Solver to solve it.

A significant advantage of using Excel Solver to solve an activity-on-node (AON) project subject to both time and cost constraints is that it eliminates the forward passing and backward passing processes (Li, Shao and Selbst, 2012), and thus avoid the tedious process to enter the formulae for the earliest start time and latest finish time individually for each activity.

2. ASSUMPTION

It is assumed that the activity completion time is PERT distributed. A PERT distribution has three parameters: min (a), most likely (m) and max (b). Its mode and mean (μ) are m and $(a+4m+b)/6$, respectively.