

From Excel to AI: A Comparative Study of PERT/CPM Pedagogy in India and the USA

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Abstract

PERT (Program Evaluation and Review Technique) and CPM (Critical Path Method) are foundational analytical tools in project management and operations management education (Best and Lewis, 2020). Despite their conceptual importance, these techniques have historically been taught through labor intensive methods, including chalk and blackboard instruction in India and spreadsheet or costly subscription based project management software in the United States, both of which divert student cognitive effort from conceptual understanding toward mechanical calculation (Arenas-Marquez et al., 2012). This paper presents a comparative analysis of PERT/CPM pedagogy across these two educational contexts and evaluates the impact of transitioning to an AI powered interactive dashboard as an instructional medium. In India, traditional classroom delivery relies on hand drawn network diagrams and manual forward backward pass computation. In the USA, Microsoft Excel and project management software have become the dominant tools, requiring students to construct 40 to 60 interdependent formulas per problem. Both approaches introduce significant barriers between students and the core scheduling concepts (Maj, 2024). PERTfect Planner, an AI driven R Shiny web application, is proposed as a pedagogically superior alternative (Doi et al., 2016). The dashboard automatically computes Early Start, Early Finish, Late Start, Late Finish, and Slack values using an automated scheduling algorithm, renders dynamic Activity on Node (AON) network diagrams with color coded critical path visualization, and supports real time what if sensitivity analysis. A pilot study with 48 students demonstrated an average task completion time of 5.19 minutes compared to 40 to 60 minutes using Excel, with ease of use and clarity ratings of 4.79 and 4.77 out of 5.0, respectively. This study contributes to the literature on engineering and management education and curriculum improvement by establishing evidence based, cost effective, and modern benchmarks for technology enhanced instruction in network scheduling.

Keywords

PERT/CPM, Engineering Education, AI-Powered Dashboard, R Shiny, Critical Path Method.

Biographies

Mr. B. Prudhvi Raj is an M.Tech graduate specializing in Industrial Engineering, currently working as an Assistant Professor with 2 years of teaching experience. His expertise includes Operations Research, and he is passionate about simplifying complex engineering concepts for students.

Dr. Bhaskar Patel is an accomplished academic leader with over 38 years of experience in engineering education. He currently serves as Principal and Director at CREC, Tirupati, and has held key positions including Director of IIIT (RGUKT), Ongole campus. He holds degrees from S.V. University, IISc Bangalore, and a Ph.D. from the University of the West of England, UK. His expertise includes Operations Research, Supply Chain Management, and AI in logistics. Dr. Patel has published 25 research papers, worked internationally, and provided consultancy to organizations like Oracle and KPMG. He is also a recognized Ph.D. supervisor and recipient of multiple academic excellence awards.

Dr. Shraddha Gawankar is an Assistant Professor for Practice with a Ph.D. in Operations Management from the Indian Institute of Management Mumbai. She has over eight years of teaching experience in business schools, specializing in Business Statistics, Operations Management, Project Management, Business Analytics, and Supply Chain Management. Her teaching integrates R, Python, Excel, and AI driven analytics to develop industry ready skills among students. Her research focuses on the application of artificial intelligence, automation, and digital technologies to improve supply chain performance and resilience. She has published in reputed international journals, including the International Journal of Production Research and International Journal of Production Economics. Dr. Gawankar is also a member of the Industrial Engineering and Operations Management Society and Production and Operations Management Society.