Solving Multi-Projects Scheduling Problems with Local and Global Resources

Constraints (RCMPSP) Using A Heuristic Approach

Faisal Al Rawahi

Abstract

Resource-Constrained Multi-Project Scheduling Problem (RCMPSP) is a problem of scheduling multiple projects that share limited resources simultaneously. From literature, it is well known that this problem is hard-non-polynomial in nature, which means that whenever a solution is obtained, it is challenging to ensure it is optimal, especially in the case of complex problems. As reported in literature, several approaches and techniques have been proposed to solve such a problem to get satisfactory results. This research aims to develop and implement a new heuristic to solve the RCMPSP to generate a feasible schedule that minimizes the total tardiness cost of projects within a portfolio. The present heuristic has been tested by solving 41 multi-project scheduling problems taken from the published library to get the average project delay (APD) and total make-span (TMS) of the projects within the portfolio. The obtained solutions have been compared with those of 3 other heuristics that have been used to solve the same problems. The findings have revealed that the current heuristic scores minimum APD and TMS together in 19.5% of solved problems (total 41 problems) in comparison with other algorithms. Besides, this heuristic has scored the lowest in both ADP and TMS in 27% and 39% of solved problems respectively. The results confirm that this algorithm effectively makes scheduling in case of limited resources in portfolio management.

Furthermore, it can be applied in various construction, manufacturing and IT projects by reducing the tardiness cost and finishing within the target time. It will help managers predict each project's duration and its tardiness cost within the portfolio before execution. Moreover, it facilitates managing the allocation of limited available resources during the execution of the projects. Finally, it gives them psychological comfort as it helps them make successful management planning of the scheduling process.

Keywords: Project Scheduling, Multi-Projects Scheduling, Local and Global Resources Constraints, Portfolio Management, MPSP Library