An integrated model for production planning and cell formation in cellular manufacturing systems

ABSTRACT

Cellular manufacturing (CM) is a production approach directed towards reducing costs, as well as increasing system's flexibility in today's small-to-medium lot production environment. Many structural and operational issues should be considered for a successful CM design and implementation such as cell formation (CF), production planning, and facility layout. Most researchers have addressed these issues sequentially or independently, instead of jointly optimizing a combination of these issues. In order to attain better results to ensure that the system will be capable of remaining efficient in unknown future situations, these issues should be addressed simultaneously. In this paper, a mathematical model is developed using an integrated approach for production planning and cell formation problems in a CM. A set of numerical examples are provided from existing the literature in order to test and illustrate the proposed model. In order to evaluate and verify the performance of the proposed model, it is compared with a well-known cell formation methods (rank order clustering and direct clustering analysis), using group capability index (GCI) measure. The results and comparisons indicate that the proposed model has a significantly higher and satisfactory performance and it is reliable for the design and the analysis of CM systems.