A Goal Programming Approach to the Team Formation Problem

Fang Liang [†] Stephen Lawrence [‡]

Leeds School of Business University of Colorado 419 UCB Boulder, CO 80309-0419

ABSTRACT

The team formation problem consists of forming a work team from a large collection of candidates with disparate skills and attributes. The team formation problem is ubiquitous in practice, for example, product development teams formed from marketing, engineering, and finance skills; software development team formed from programmers and software engineers with needed programming and systems skills; and construction management teams formed from architects, civil engineers, designers, and construction engineers. The generally used methods to form team are random assignment, self-selection and facilitator assignment.

We formulate the team formation problem as a mixed integer linear goal program. The use of goal programming is appropriate in this context because the constraints of the team formation problem are usually soft or fungible, and can be traded off against one another depending on their priority. Our formulation also allows for the inclusion of "hard" or categorical constraints. Since the team formation problem is known to be NP-Hard, we develop a heuristic solution methodology to rapidly find good solutions to the problem. We adapt the Greedy Randomized Search Procedure (GRASP) to the team formation problem and test on a variety of problems. In addition, we employed standard IP solution software to solve our set of test problems to optimality, where possible.

Preliminary results indicate excellent performance for the GRASP method in this context. For the problems tested, GRASP provided the optimal solution wherever an optimal solution could be found. In several cases for reasonably sized problems (50 team members) an optimal solution could not be identified even after 1 hour of computation. In contrast, the GRASP method found its solutions in less than 3 seconds, even for the largest problems. Future research will test a larger, more complex set of problems, and will verify the effectiveness of the GRASP method in solving the team formation problem across a large range of problem settings.

[†] Fang.Liang@colorado.edu [‡] Stephen.Lawrence@colorado.edu