

Optimisation Model for Maximising Social Sustainability in Construction Scheduling

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Abstract : The construction industry is labour intensive, and the behaviour and management of workers have a direct impact on the performance of construction projects. One of the issues it currently faces is how to recruit and maintain its workers. Construction is known as an industry where workers face the problem of short employment durations, frequent layoffs, and periods of unemployment between jobs. These challenges not only creates pressures on the workers but also project managers have to constantly train new workers, face skills shortage, and uncertainty on the quality of the workers it will attract. To consider worker's needs and project managers expectations, one practice that can be implemented is to schedule construction projects to maintain a stable workforce. This paper proposes a mixed integer programming (MIP) model to schedule projects with the objective of maximising social sustainability of construction projects, that is, maximise labour stability. Aside from the social objective, the model accounts for equipment and financial resources required by the projects during the construction phase. To illustrate how the solution strategy works, a construction programme comprised of ten projects is considered. The projects are scheduled to maximise labour stability while simultaneously minimising time and minimising cost. The tradeoff between the values in terms of time, cost, and labour stability allows project managers to consider their preferences and identify which solution best suits their needs. Additionally, the model determines the optimal starting times for each of the projects, working patterns for the workers, and labour costs. This model shows that construction projects can be scheduled to not only benefit the project manager, but also benefit current workers and help attract new workers to the industry. Due to its practicality, it can be a valuable tool to support decision making and assist construction stakeholders when developing schedules that include social sustainability factors.

Keywords : labour stability, mixed-integer programming (MIP), scheduling, workforce management

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