The Stillwater Mining Company (SMC) in south-central Montana, the nation’s leading producer of platinum metal groups, needed a tool to help analyze ways to increase production and profits. The authors’ help was solicited to create a mixed-integer programming model that helped optimize the scheduling of activities that maximize revenue such as mine layout, projected ore quality, and projected costs for basic mining activities. Some of the questions that SMC looked to answer were: (1) how quickly can SMC ramp up production, (2) what labor will this require, (3) what will the corresponding operating costs be, and (4) what will the corresponding net revenue stream be.

The model focused on scheduling the underground drilling operations in the most efficient and profitable manner. The main focus was on scheduling development, drilling, preparation, and production. Time was divided into quarter-year segments for ten quarters. It was assumed that each activity took exactly one quarter. Also transportation costs were not factored into the formulation. The decision to be made was whether or not to perform each activity in a given quarter \(x_{ij} = 1\) if activity \(j\) is selected in quarter \(i\). The objective was to minimize the sum of the discounted quarterly production of ounces of platinum group metals over the entire planning horizon.

The results helped SBC complete an $86 million initial public offering to fund a doubling of the size of its underground mine and surface facilities. The doubling of
production was essential for SBC to increase profits. The model given by the authors allowed SBC to assess the impact of changing the size of the labor force, varying the spacing between mining levels, optimizing production over different time horizons and smoothing out periodic variations in mining activities.