CASE 15:
MINER'S DILEMMA

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Firm Style	Interview Round
BCG, Bain	1

Case Question:

Your client is in the mining industry. They have just purchased a mountain that has high concentrations of a valuable metal ore. Unfortunately, the mountain is made up of an unusually hard type of rock and none of the commercially available drills are able to penetrate the mountain's surface. Your client's engineers have built a prototype of a drill that could be used to extract the metal from the mountain. The client is not sure about whether to manufacture the drill and has doubts regarding profitably mining at the mountain. Help the client think through the issue.

Clarifying Questions & Answers

Provide the following answers only if the interviewee asks the corresponding questions.

Question	Answer
Is there any way to mine without having to manufacture the drill?	No
Is it possible to manufacture the drill that the client has prototyped?	Yes, the client can manufacturer the drill in-house.
Is it possible to outsource the production of the drill to one of our suppliers or other manufactures?	Yes, there is a supplier who is capable and willing to manufacture the drill.

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Framework / Structure

This is a cost-analysis and profitability case.

Phase I – Understand more about the client's plan for the mine

- Can you tell me more about the useful life of the mine and the extraction rates the client is hoping to pursue?
  - The client plans to extract ore from the mine for 20 years from the date drilling commences. After that the mine will be retired with no salvage value.
  - Additionally the client is concerned about flooding the market and will cap annual extraction as per the following schedule:
    - Years 1 – 5: < 10% of total US production
    - Years 6 – 10: < 15% of total US production
    - Years 10 – 15: < 20% of total US production
    - Years 15 – 20: < 25% of total US production
  - For logistical reasons (transportation, etc.) they must also cap annual extraction to 12,000 tons.
- What is the annual US production?
  - The annual US production is 64,000 tons.

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Phase II - Determine which of two drill options is more cost effective.

Manufacture Drills In-House

- What are the costs to the client if they decide to manufacture their own drills?
  - There will be a $30MM fixed setup cost and a variable cost of $100,000 per drill.
- How many drills will the client need if they produce their own drills?
  - Using their own design, each drill will be able to mine 500 tons of ore per year. b. Each drill that the client produces will last 4 years at the given rate of mining.

Outsource Drill Production

- What are the costs to the client if they outsource production of drills?
  - Each drill will cost the client $250,000 but there will be no setup cost.
- How many drills will the client need if they buy from a supplier?
  - The manufacturer estimates that each drill of their design will be able to mine 400 tons of ore per year.
  - The manufacturer estimates a 2.5 year lifespan for their drills at the given rate of mining.

Phase III - Determine which option is more profitable.

- Can you tell me more about the ore? How much is it worth?
  - For every ton of ore extracted the client will realize $325 in revenue.
- How much does the mine cost to operate?
  - $1MM per year.

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Strong Plan

The candidate has successfully identified both the issues in the case – drill cost effectiveness and profitability of mining at the mountain. The candidate also asked questions about the client's mining plan and associated constraints.

Weak Plan

The candidate makes basic assumptions about the size of the mine and number of drills typically needed. He starts working to a solution without considering the outsourcing option.

Calculations

Total amount of ore to be mined over the life of the mountain:

- Years 1 – 5: 10% of 64,000 tons = 6,400 tons per year
- Years 6 – 10: 15% of 64,000 tons = 9,600 tons per year
- Years 11 – 15: 20% of 64,000 tons = 12,800 tons per year, but client is constrained to a maximum of 12,000 tons per year
- Years 16 – 20: 25% of 64,000 tons = 16,000 tons per year, but client is constrained to a maximum of 12,000 tons per year
- Total to be mined over 20 years: (6,400 x 5) + (9,600 x 5) + (12,000 x 10) = 200,000 tons

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Number of drills needed if manufactured by client:
(200,000 tons) / (4 years per drill x 500 tons per drill per year) = 100 drills

Number of drills needed if outsourced:
(200,000 tons) / (2.5 years per drill x 400 tons per drill per year) = 200 drills

Total cost if client manufactures drills:
$30MM fixed cost + $100,000 variable cost per drill x 100 drills = $40MM

Total cost if client outsources drills:
$0 fixed cost + $250,000 variable cost per drill x 200 drills = $50MM

Total revenue from mining activities:
200,000 tons x $325 revenue per ton = $65MM

Profitability if client manufactures drills:
$65MM in revenue - $1MM operating cost per year x 20 years - $40M drill cost = $5MM

Profitability if client outsources drills:
$65MM in revenue - $1MM operating cost per year x 20 years - $50M drill cost = $-5MM

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Recommendation

The recommendation should include the following:

- The client should manufacture their own drills to make the operation profitable. Over the life of the project, outsourced drills cost $10MM more than drills manufactured in-house.
- Risks or considerations
  - There is a risk of cost overrun in setting up in-house manufacturing facility. It will be important to secure the $30MM construction cost with the contractors.
  - Additionally, our client may want to pursue the sale of drills to other mining companies that own property with the same geologic makeup.

Questions to Further Challenge to Interviewee

- Do you think it may strain relations with the client's drill supplier if they begin to manufacture their own drills? What can the client do to mitigate this possibility?
- Do you think there might be a third solution? What about working with the supplier to have them manufacture the drills that your client's engineers have designed? How could that be good for your client?
- Based on what you've calculated, what could change that would make outsourcing more optimal?