

## **Practice exercise 19 evaluation guide (for online appendix)**

Allocate yourself points for identifying the following aspects of failure.

Company core business: This was the wrong project for Minprom at that time. Minprom, with mining as their core business, was a company accustomed to handling large quantities of rocks at normal temperatures without any aspect of special chemical processing. The company did not have any expertise in high temperature, high-pressure, petrochemical process plants. [5–10 points]

Location: An engineering enterprise that requires highly skilled and experienced people needs to be located in a place where they and their families want to live. [10 points]

Bypassing stage decision-making processes: Minprom reduced the cost of their initial \$100 million feasibility study by \$50 million by deciding to leave out the critical pilot plant stage. A different decision might have spared the company and its shareholders much of the consequential estimated loss of \$5 billion, including the cost of cancelling take-or-pay gas contracts for the plant. [10 points]

Influence: Engineers in the project team who had anticipated the project failure from a very early stage were unable to exert influence on company decision-making. Outside consultants hired to report on the state of the project anticipated its ultimate failure. [10 points]

Engineering failure: Many engineers are inclined to see this as a ‘science failure’ or a ‘business failure’, suggesting that it was not an engineering failure. There are four critical reasons that require us to accept that this was an engineering failure.

- First, the owning company is a vast engineering enterprise; engineers were and still are highly influential in Minprom from top to bottom. [5 points]
- Second, there were numerous engineering failures ranging from the release of drawings with basic construction errors to the arrangement of the major contracts that enabled inexperienced people to take responsibility for critical decisions. [5 points]
- Engineers are required to be aware of the limitations of known science and take precautions to verify the accuracy of scientific predictions before spending large amounts of investors’ money. [5 points]
- Finally, engineers rely on large amounts of money to do anything; engineers can never step aside from ultimate financial responsibility. [5 points]