Decision Analysis: Exercise 1

The Problem

The manager of a company must decide whether to manufacture a new product and if so whether to build a large or small production plant. The planning period is 10 years. The crucial unknown factor is the size of the market for the product. A big plant, if built now, must be run for the next 10 years. A small plant, if built now, could be expanded after 2 years. More delayed building schemes are not considered, as they would allow competitors to dominate the market if demand is high.

Marketing Information

The marketing section suggests that there is a:

- 60% chance that demand will be high for the whole 10 year period.
- 30% chance that demand will be low for the whole 10 year period.
- 10% chance that demand will be high for the first 2 years and then fall to low demand for the next 8 years.

Accounting Information

The accounting section put forward the following estimates:

- A large plant with high demand would yield $2m annually.
- A large plant with low demand would yield $0.2m annually (due to high fixed costs).
- A small plant with low demand would yield $0.8m annually (being more economical to run).
- A small plant with high demand would yield $0.9m annually for the first two years, falling to $0.5m annually thereafter (due to competition from other producers).
- If an initially small plant were expanded after 2 years and demand stayed high, then it would yield $1.4m annually for the remaining 8 years.
- If an initially small plant were expanded after 2 years and demand fell from high to low, then the plant would yield $0.1m annually for the remaining 8 years.

Capital Costs

Estimates from the construction department suggest that:

- A large plant would cost $6m.
- A small plant would cost $2.6m.
- The expansion costs from small to large after 2 years would be $4.4m.

Exercise

Should the company build? If so, should the initial plant be large or small?

Draw the decision tree. Find the decision which maximises expected money return over the 10 year period. Find and interpret the expected value of perfect information. Discuss whether expected money return is a sensible way of choosing a decision in this problem.