

Solutions

1.1. Answers will be based on personal experience. It is important here to be sure the distinction is made between good decisions on one hand (or a good decision-making process) and lucky outcomes on the other.

1.2. We will have models to represent the decision structure as well as uncertainty and preferences. The whole point of using models is to create simplifications of the real world in such a way that analysis of the model yields insight regarding the real-world situation. A requisite model is one that includes all essential elements of the problem. Alternatively, a requisite model is one which, when subjected to sensitivity analysis, yields no new intuitions. Not only are all essential elements included, but also all extraneous elements are excluded.

1.3. Subjective judgments will play large roles in the modeling of uncertainty and preferences. Essentially we will build representations of personal beliefs (probabilities) and preferences (utilities). In a more subtle — and perhaps more important — way, subjective judgments also direct the modeling process. Subjective judgments are necessary for determining the appropriateness of a model's structure, what should be included in the model, and so on. Thus, subjective judgments play central roles in decision analysis. Good decision analysis cannot be done without subjective judgments.

1.4. An appropriate answer would be that decision analysis can improve your decisions — the way you make decisions — by providing a framework for dealing with difficult decisions in a systematic way. Along with the analytical framework, decision analysis provides a set of tools for constructing and analyzing decision models, the purpose of which is to obtain insight regarding difficult decision problems.

1.5. You require her subjective judgments on a number of matters. First is the problem of identifying important aspects of the problem. Her input also will be required for the development of models of her uncertainty and her preferences. Thus, her judgments will be critical to the analysis.

This question may also lead students to consider the implications of delegating decisions to agents. How can you ensure that the agent will see things the way you do? Will the same aspects of the problem be important? Does the agent agree with you regarding the uncertainty inherent in the situation (which outcomes are more or less likely)? Does the agent have the same feeling regarding trade-offs that must be made? In many cases it may be appropriate to obtain and use an expert's information. Can you identify some specific decision situations where you would be willing to accept an agent's recommendation? Does it matter who the agent is? Can you identify other situations in which some of the agent's input can be taken at face value (a forecast, say), but must be incorporated into a model based primarily on your own judgments?

1.6. Answers will be based on personal experience.

1.7. Some of the issues are 1) damage to forests and crops (especially Christmas trees), 2) the risks of pesticide use to human health and the environment, 3) the effectiveness of the pesticides.

Alternatives include 1) do nothing, 2) use only BT, 3) use only Orthene, 4) explore other pesticides, 5) use some mixture of pesticides, 6) spray a specific area, ...

The major sources of uncertainty have to do with the pesticides. What will be the effect of the pesticide, both long-term and short-term, on the moth population? What would be the long-term extent of the infestation without spraying? What will be the short-term and long-term effects on human health and the environment? Sources of information are limited, and long-term studies are not feasible. The decision must be made in the face of substantial uncertainty.

The objectives that different groups want to work toward include 1) minimize risks to health and environment, 2) minimize pests, crop damage, defoliation, 3) maximize profits, 4) maximize enjoyment of nature, 5) minimize disruption of daily activities due to treatment. Some students may identify still other objectives. Trading off these objectives may mean trying to balance the issues that are important to different constituent groups.

1.8. This is a creativity question. Pheromones (hormone-based attractants) might be used. Perhaps the forests could be vacuumed with giant vacuum cleaners? Have schoolchildren engage in extensive insect-collection projects?

1.9. Answers will be based on personal experience.

1.10. Instead of thinking only about risk versus return, the socially responsible investor also must consider how to trade off risk and return for ethical integrity. It would not be unreasonable to suspect that to obtain a higher level of ethical integrity in the portfolio, the investor must accept a lower expected return, higher level of risk, or both.

1.11. For the most part, decision analysis is most appropriate for strategic, or one-time, decisions. These are situations that we have not thought about before and “don’t know what to do.” Hence, it is worthwhile to engage in some “decision making,” or decision analysis, to figure out what would be an appropriate action.

This is not to say that decision analysis is inappropriate for repetitive decisions. In fact, if a decision is repeated many times, the savings that can be achieved over time by improving the decision-making process can be substantial. In fact, this is the basis of much of management science. However, the reliance on subjective judgments for the construction of tailored decision models in each decision situation may render decision analysis, as portrayed here, unsuitable for dealing with repetitive situations. The point, though, is that if one anticipates a long string of repetitive decisions in the future, and an optimal decision strategy has not been previously developed, then the situation is indeed one of “not knowing what to do.” A decision-modeling approach would indeed be appropriate in that case.

1.12. Beliefs and values do appear to change and develop over time as we think about new issues. Decision analysis implicitly provides a framework for such changes through the identification and modeling of decision problems, beliefs regarding uncertainty, and preferences.