



# Ch.8 Prescriptive Analytics: Optimization and Simulation

- ▼ What is prescriptive analytics?  
making decisions using some kind of analytical model
- ▼ What is decision analytics?  
the category of analytics that focuses on making recommendations or making decisions
- ▼ What is environmental scanning and analysis?  
a continuous process of intelligence building identification of problems and/or opportunities via acquisition and analysis of data/information
- ▼ What are influence diagrams?  
graphical models of mathematical models
- ▼ What is forecasting?  
using data from the past to foresee the future values of a variable of interest
- ▼ What is a static model?  
a model that captures a snapshot of a system, ignoring its dynamic features
- ▼ What is a dynamic model?  
a model that captures/studies systems that evolve over time
- ▼ What is the objective of this model: Optimization of problems with few alternatives  
Find the best solution from a small number of alternatives
- ▼ How do you represent this model: Optimization of problems with few alternatives

Decision tables, decision trees, analytic hierarchy process

▼ What is the objective of this model: Optimization via algorithm

Find the best solution from a large number of alternatives, using a step-by-step improvement process

▼ How do you represent this model: Optimization via algorithm

Linear and other mathematical programming models, network models

▼ What is the objective of this model: Optimization via an analytic formula

Find the best solution in one step, using a formula

▼ How do you represent this model: Optimization via an analytic formula

some inventory models

▼ What is the objective of this model: Simulation

Find a good enough solution or the best among the alternatives checked, using experimentation

▼ How do you represent this model: Simulation

several types of simulation

▼ What is the objective of this model: Heuristics

Find a good enough solution, using rules

▼ How do you represent this model: Heuristics

Heuristic programming, expert systems

▼ What is the objective of this model: Predictive models

Predict the future for a given scenario

▼ How do you represent this model: Predictive models

Forecasting models, Markov analysis

▼ Why must models be managed?

to maintain their integrity and thus their applicability

▼ What is multidimensional analysis (modeling)?

a modeling method that involves data analysis in several dimensions and data are generally shown in a spreadsheet format

▼ What 4 basic components make up quantitative models?

- result or outcome or dependent variables
- decision variables
- uncontrollable variables and or parameters
- intermediate result variables

▼ What determines the results of decisions?

- the decision made (i.e. the values of the decision variables)
- the factors that cannot be controlled by the decision maker (the environment)
- the relationships among the variables

▼ What are decision variables?

a variable of interest that describes a particular course of action

▼ What are uncontrollable variables?

mathematical modeling variables that have to be taken as given—not allowing changes/modifications

▼ What are parameters?

numeric constants are used in mathematical modeling

▼ What are intermediate result variables?

they reflect intermediate outcomes in mathematical models

e.g. employee satisfaction (intermediate outcome) and productivity level (final result)

▼ Example of a simple financial model

- $P = 100,000 / (1 + 0.1)^5 = 62,092$
  - $P$  = present value
  - $F$  = a future single payment in dollars
  - $i$  = interest rate (percentage)
  - $n$  = number of years
  - You can determine the present value of a payment of \$100,000 to be made 5 years from today, at a 10% (0.1) interest rate.
- ▼ What are the zones of decision making?
- Certainty aka Complete Knowledge
- Risk aka Increasing/Decreasing Knowledge
- Uncertainty aka Total Ignorance
- ▼ What is risk?
- a probabilistic or stochastic decision situation
- ▼ A decision made under risk is one in which what?
- the decision maker must consider several possible outcomes for each alternative, each with a given probability of occurrence
- ▼ What is risk analysis (calculated risk)?
- a decision-making method that analyzes the risk (based on assumed known probabilities) associated with different alternatives
- ▼ What model solution tasks can spreadsheets perform?
- linear programming
  - regression analysis
- ▼ What is mathematical programming?
- a family of tools designed to help solve managerial problems in which the decision maker must allocate scarce resources among competing activities to optimize a measurable goal