

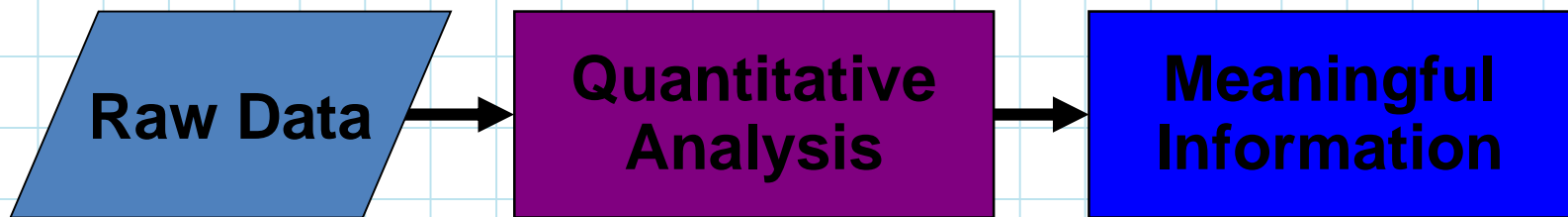
Introduction to Quantitative Analysis

Introduction

- Mathematical tools have been used for thousands of years
- Quantitative analysis can be applied to a wide variety of problems
- It's not enough to just know the mathematics of a technique
- One must understand the specific applicability of the technique, its limitations, and its assumptions

What is Quantitative Analysis?

Quantitative analysis is a scientific approach to managerial decision making whereby raw data are processed and manipulated resulting in meaningful information



What is Quantitative Analysis?

Quantitative factors might be different investment alternatives, interest rates, inventory levels, demand, or labor cost

Qualitative factors such as the weather, state and federal legislation, and technology breakthroughs should also be considered

- Information may be difficult to quantify but can affect the decision-making process

The Quantitative Analysis Approach

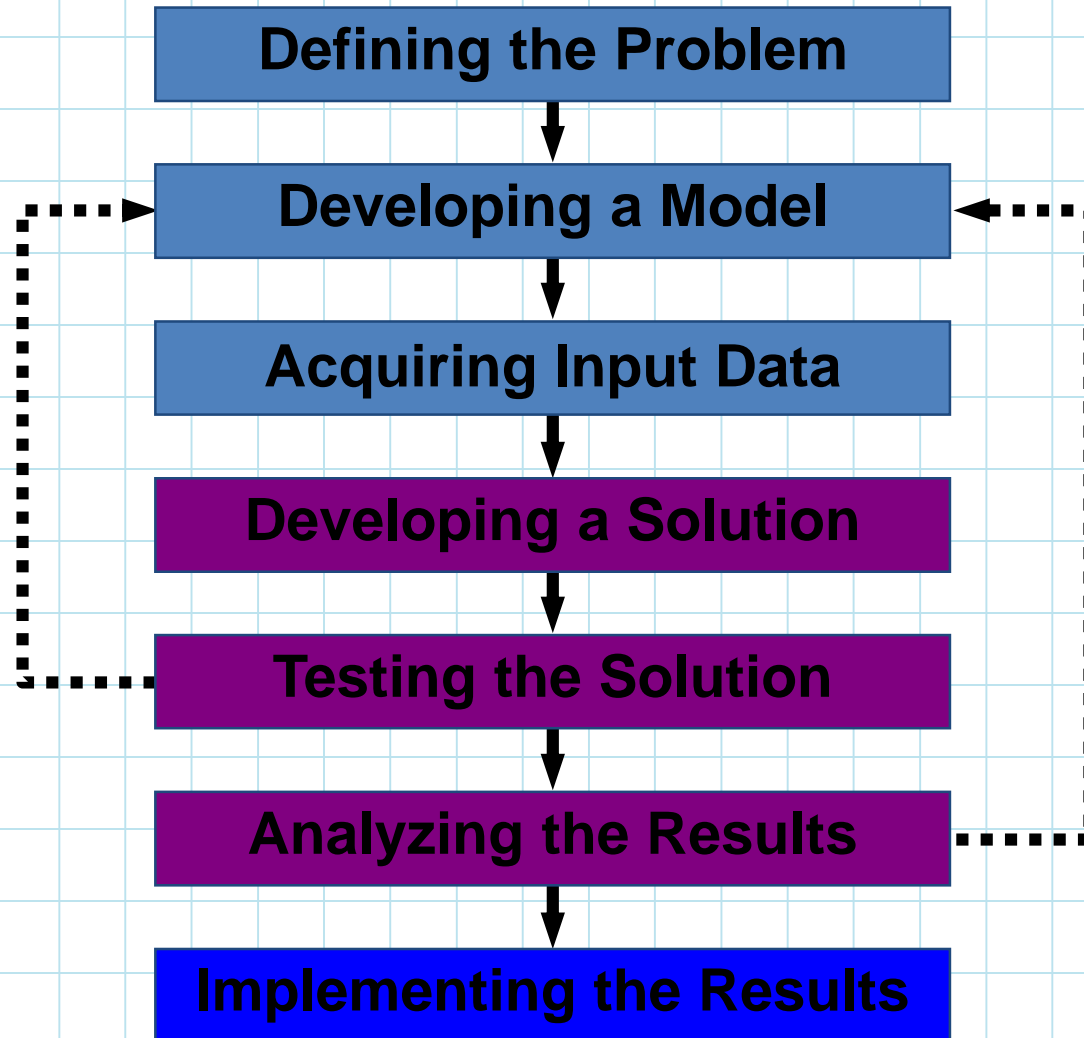


Figure 1.1

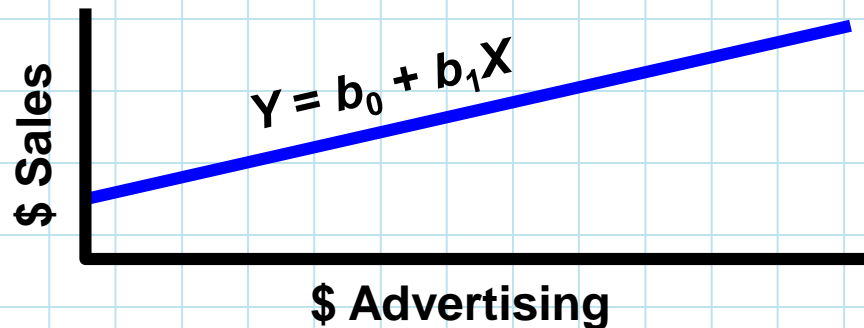
Defining the Problem

Need to develop a clear and concise statement that gives direction and meaning to the following steps

- This may be the most important and difficult step
- It is essential to go beyond symptoms and identify true causes
- May be necessary to concentrate on only a few of the problems – selecting the right problems is very important
- Specific and measurable objectives may have to be developed

Developing a Model

Quantitative analysis models are realistic, solvable, and understandable mathematical representations of a situation

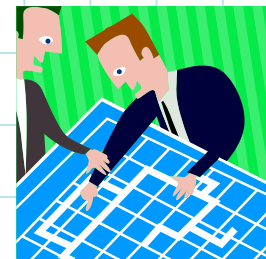


There are different types of models

Scale models



Schematic models

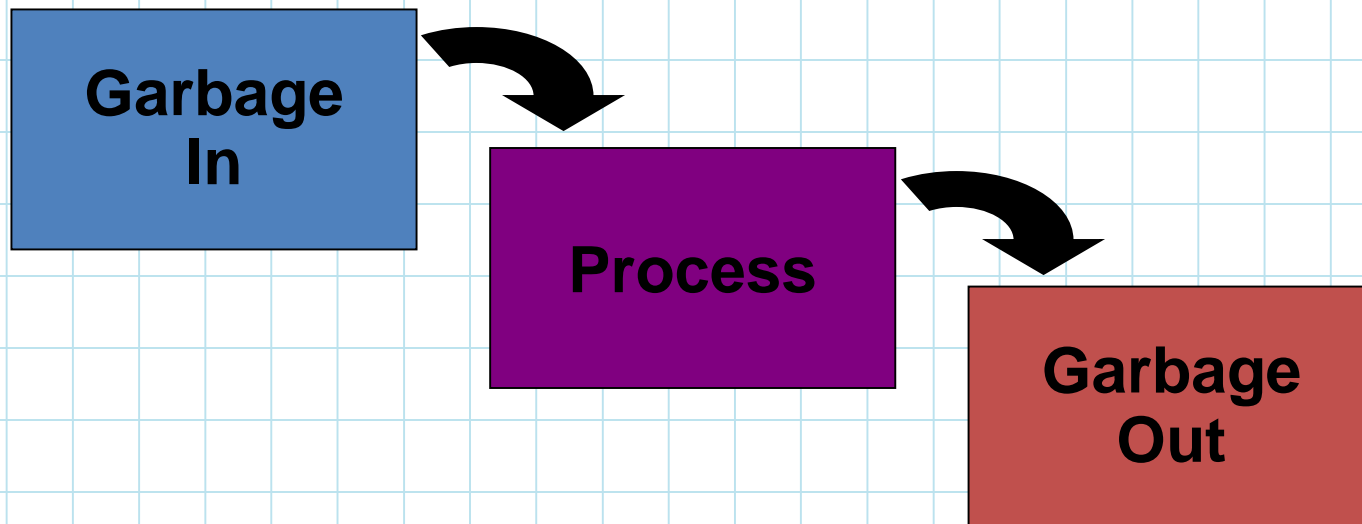


Developing a Model

- Models generally contain variables (controllable and uncontrollable) and parameters
- Controllable variables are generally the decision variables and are generally unknown
- Parameters are known quantities that are a part of the problem

Acquiring Input Data

Input data must be accurate – GIGO rule



Data may come from a variety of sources such as company reports, company documents, interviews, on-site direct measurement, or statistical sampling

Developing a Solution

- The best (optimal) solution to a problem is found by manipulating the model variables until a solution is found that is practical and can be implemented
- Common techniques are
 - *Solving* equations
 - *Trial and error* – trying various approaches and picking the best result
 - *Complete enumeration* – trying all possible values
 - Using an *algorithm* – a series of repeating steps to reach a solution

Testing the Solution

Both input data and the model should be tested for accuracy before analysis and implementation

- New data can be collected to test the model
- Results should be logical, consistent, and represent the real situation

Analyzing the Results

Determine the implications of the solution

- Implementing results often requires change in an organization
- The impact of actions or changes needs to be studied and understood before implementation

Sensitivity analysis determines how much the results of the analysis will change if the model or input data changes

- Sensitive models should be very thoroughly tested

Implementing the Results

Implementation incorporates the solution into the company

- Implementation can be very difficult
- People can resist changes
- Many quantitative analysis efforts have failed because a good, workable solution was not properly implemented

Changes occur over time, so even successful implementations must be monitored to determine if modifications are necessary