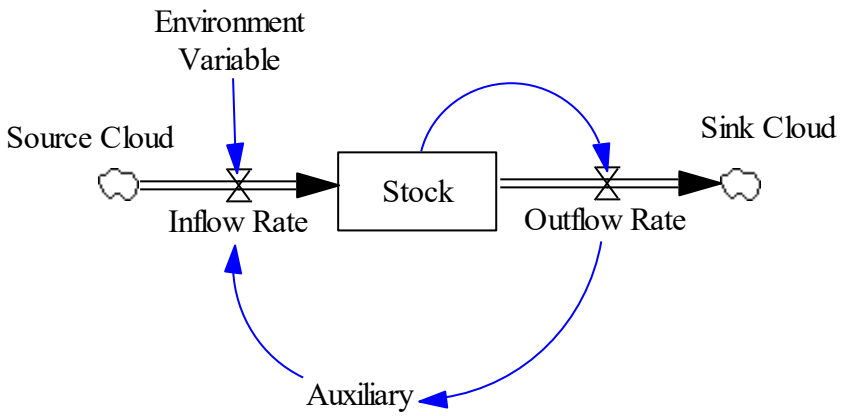
Business Dynamics chapter 6-Stock and Flow Diagrams

- Notation:



- The importance of Stock Variables
  - Characterize system states
  - Provide system inertia and memory
  - Is the source of delays
  - Consume the impacts of decisions (rates), and being the center of disequilibrium dynamics
- How to identify Stocks and Flows
  - Distinguish Stocks and Flows
    - See table 6-1
  - Through units of measure
  - Through Snapshot Test
- The Law of Material Conservation
  - Material flows vs. information flows
- Modeling centers on system states
  - States are represented by Stocks
    - Stocks in the system: stock variable (or level variable)
    - Stocks in the environment: clouds (the source of assumptions)
  - Stocks are changed through Rates (Flows)
  - Rate variables and auxiliary variables are calculated from other Stocks, Rates or auxiliary variables
  - Auxiliary Variables are presented for model clarity and better communication (Basic rule: one equation, one idea.)
- The continuous/discrete and instantaneous concept in simulation
  - The emulated instantaneous time (a reasonably small slice of delta t, should consider the smallest time delays in the model)
  - Continuous flow or discrete flow? (eq. continuous headcount, discrete

volume of fluids)

- Deciding proper level of aggregation
- Setting system boundary
  - The challenging-the-clouds approach
  - Are exogenous variables exogenous? (Explicitly specify the assumptions about the environment)
  - Choose a proper level of aggregation and a proper range of system boundary.
- A good model must be useful, while usefulness lies in:
  - The model can improve model users' decisions.
  - The users want to use the model.(Sometimes it's necessary to get into too much detail to gain clients' confidence)
- Some cases
  - Construction Project
    - Figure 6-13 vs. Figure 6-14
  - Automobile Recycling
    - Some portion of Cars on the road are scrapped or abandoned
    - Scrapped cars and some of the abandoned cars are dismantled to recycle used parts
    - Dismantled hulks and some abandoned cars are shredded as recycled materials
    - Non-recyclable materials are disposed in landfills.
    - Other considerations:
      - Supply and demand in the used parts market
      - Supply and demand in recycle material (especially the metals) market
      - Plastic cars
      - Design for disassembly (DFD) policy