



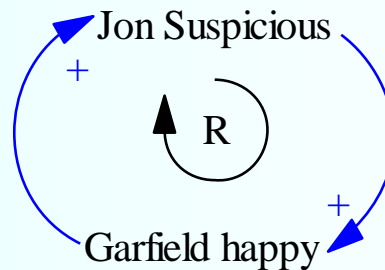
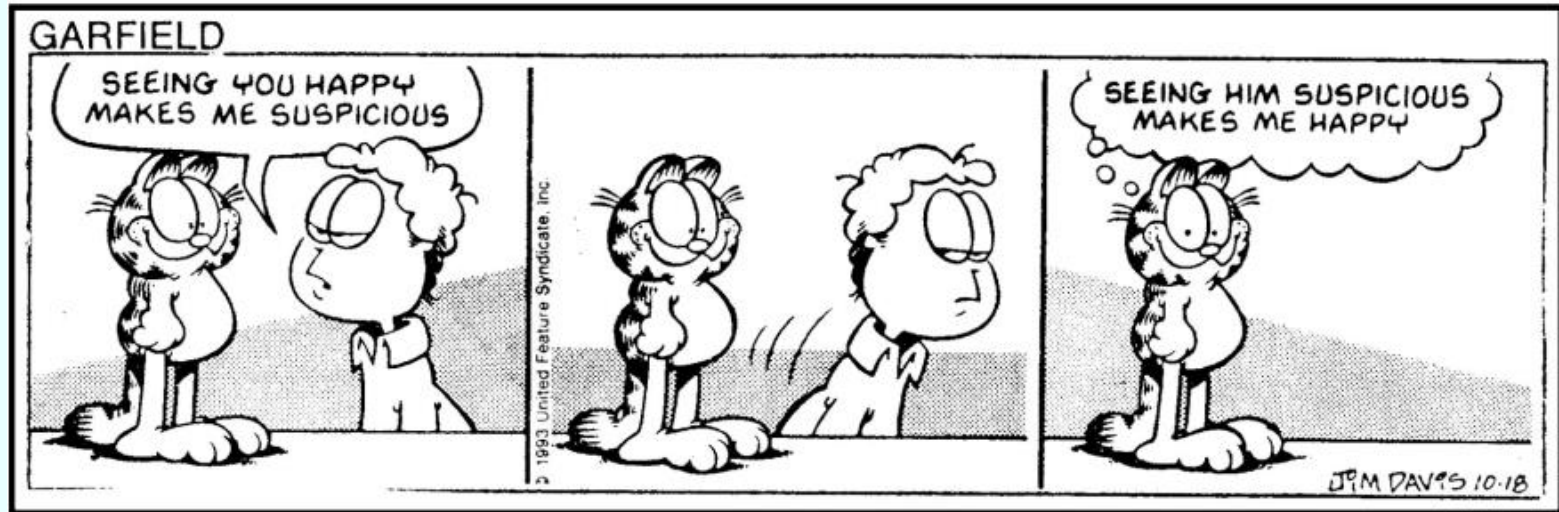
Aalto University
School of Science

System Dynamics – Loop Diagrams



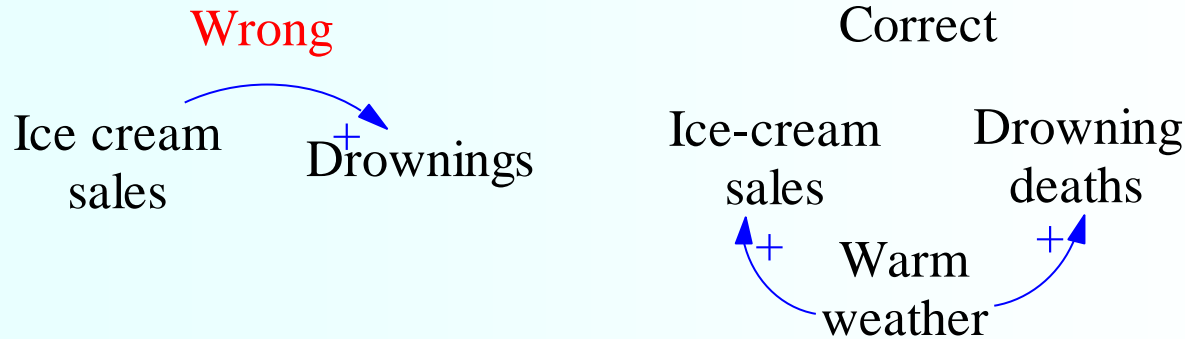
Causal feedback loops

- Causal feedback loops are a basic constructs in SD



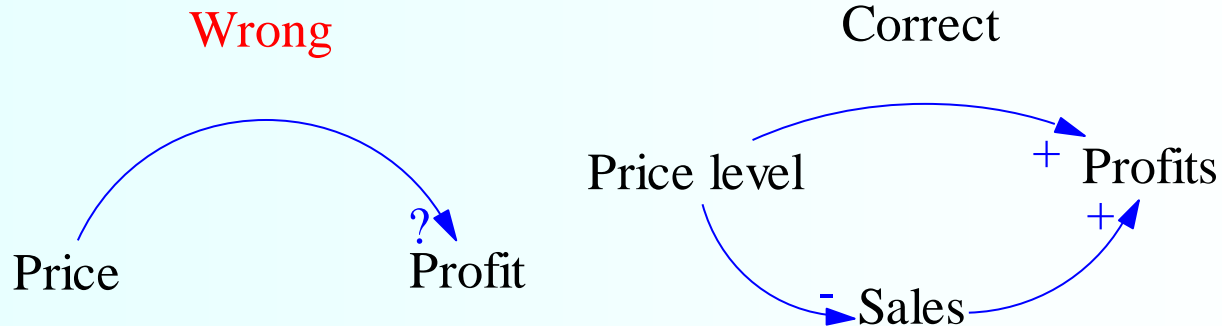
Causality vs correlation

- Unlike correlation, causality has a direction: cause \rightarrow effect
- Ice-cream sales correlates with drownings
- They indicate each other, but there is no causality



Polarity of causes

- Polarity (+/-) can be determined analytically or experimentally by observing how small change in cause changes the effect
- Polarity should always be unique



Naming variables

- Basic nouns / noun phrases – no verbs
- Direction must be obvious
- Natural direction should be positive (if possible)

Wrong

Correct

Costs increase $\rightarrow(+)$ Prices go up

Costs $\rightarrow(+)$ Prices

Feedback from boss $\rightarrow(+)$ Employer attitude

Positive feedback $\rightarrow(+)$ Work morale

Costs $\rightarrow(+)$ Deficit

Costs $\rightarrow(-)$ Profit

Criticism $\rightarrow(+)$ Dissatisfaction

Criticism $\rightarrow(-)$ Satisfaction

- Use curved arrows
- Layout to make main loops circular or elliptic
- Minimize arrow crossings
- Normal variables without frame
- Level/storage variables with box frame
- Use variables to show sufficient amount of intermediate steps
- Parameters as variables rather than hiding values in formulas
- Label and number feedback loops
- Split large diagrams hierarchically into sub-diagrams

Example: Student workload

