Modelling

29.04.15

Quick Test

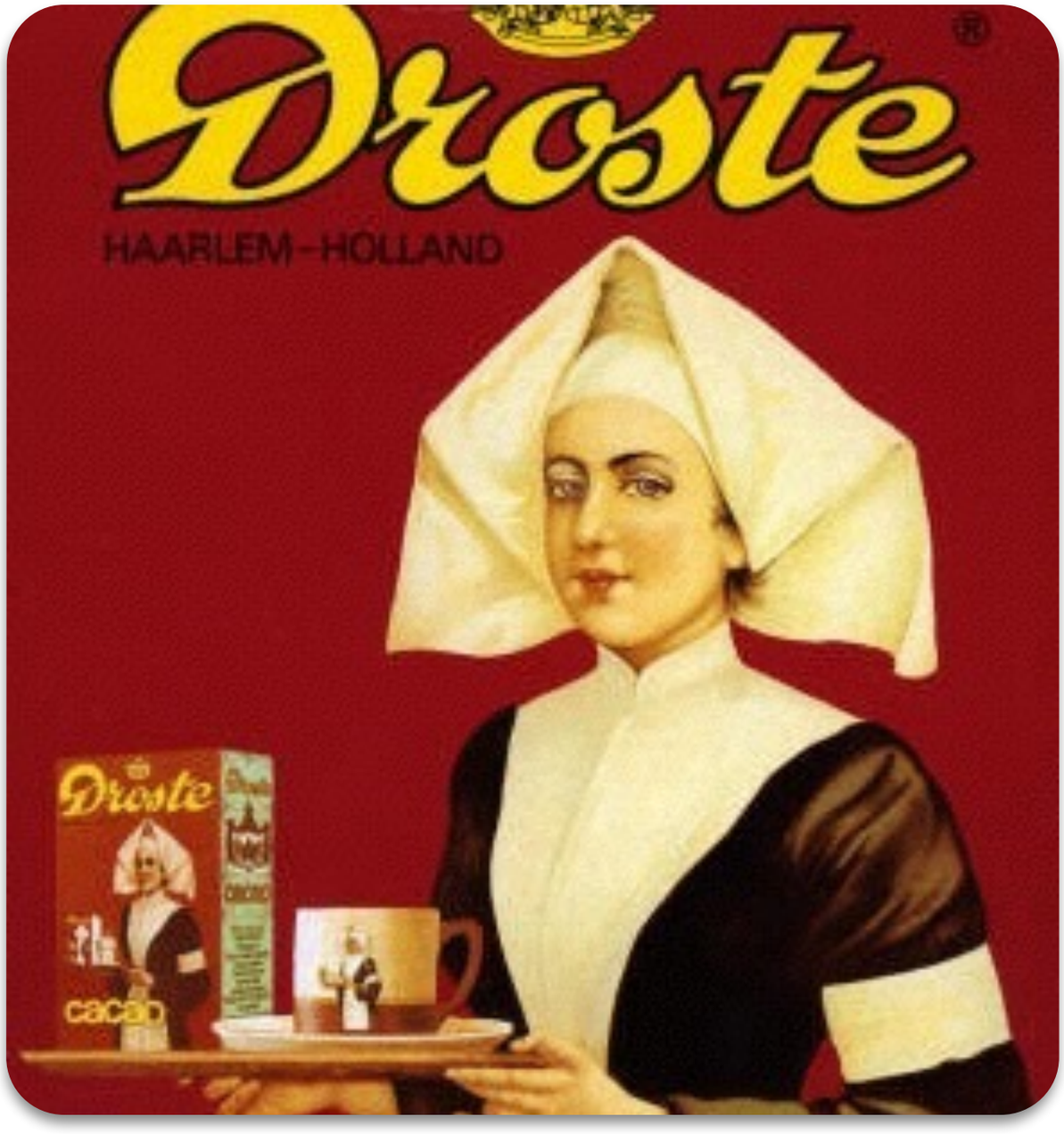
1. Differenzieren Sie in max. 5 Sätzen den Unterschied zwischen Animation und Simulation.
2. Erstellen Sie in Processing einen Array mit den Namen Thomas, Anna, Max, Friedrich und Katharina. Iterieren Sie über den Array und ändern Sie den Namen in Tom, wenn der Wert des Elements Thomas entspricht.

Klausur

27.05.

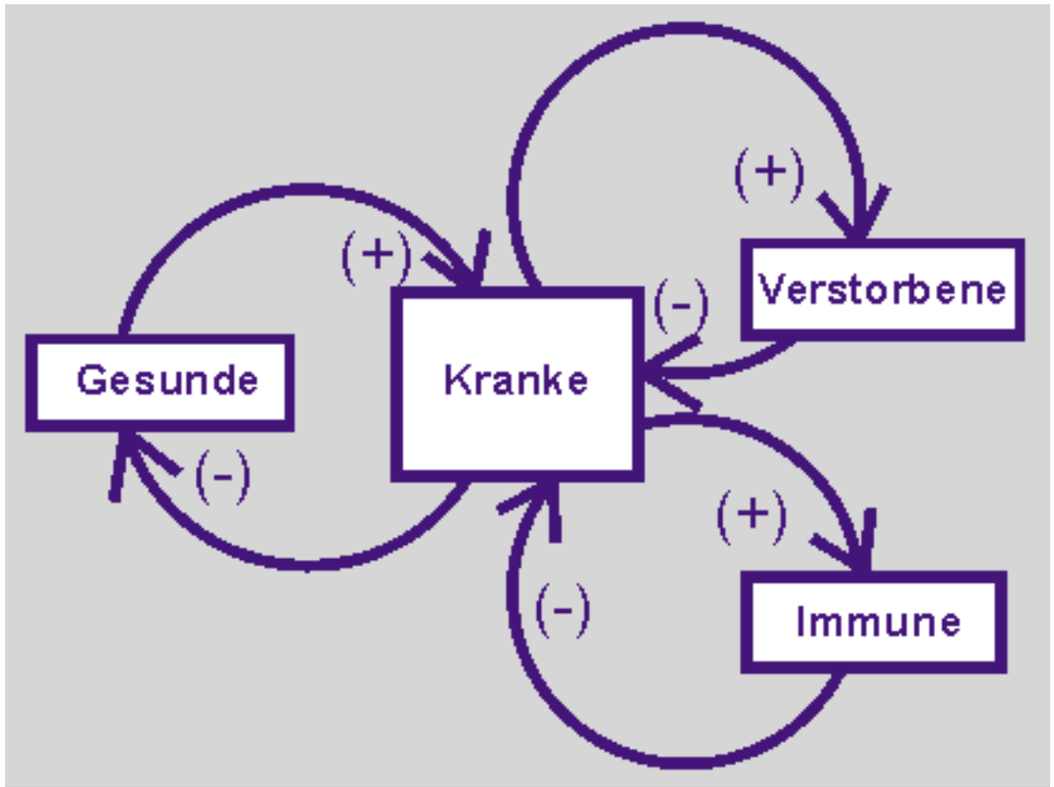
Rekursion

Someone in a movie theater asks you what row you're sitting in. You are too lazy to count, so you ask the person in front of you. You simply have to add 1 from the person's answer to get your current row number. Brilliant right? However, the person in front of you did exactly the same thing, and so on. Finally the question reaches row 1 and he answers: "I'm in row 1!". From there, the correct message (incremented by one each row) will pass all the way up to the person who asked.

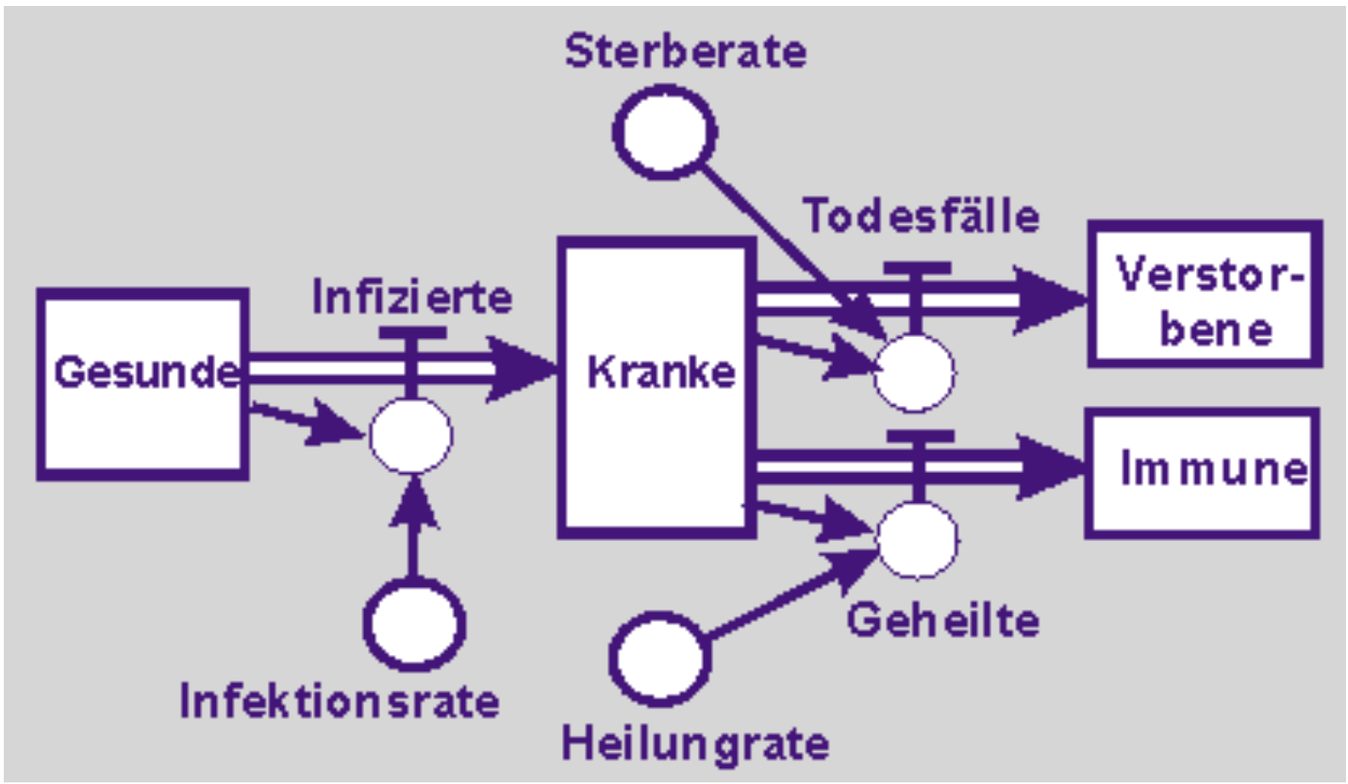


Causal Loop Diagram

Development of action/reaction structure e.g. Causal loop diagram (CLD)

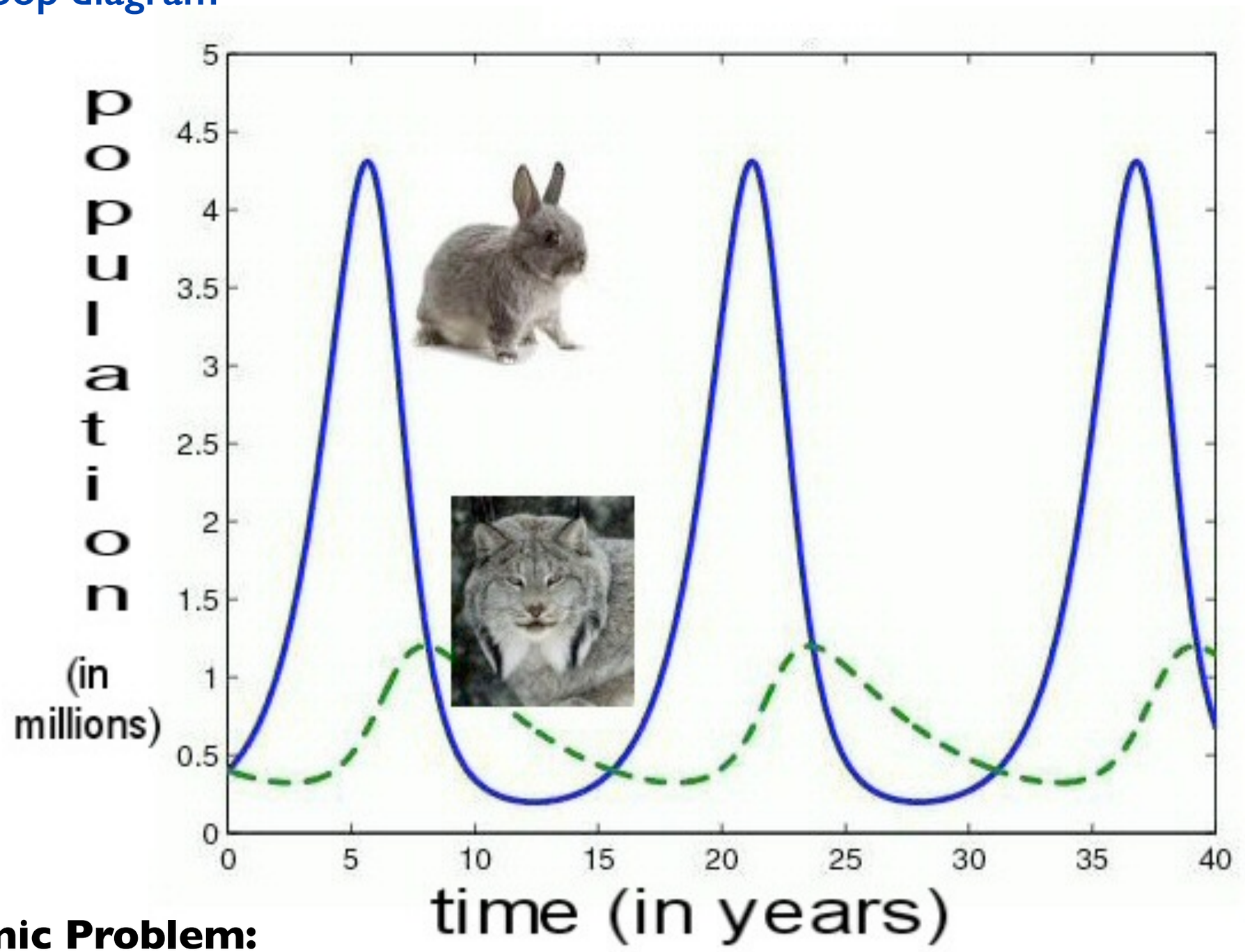


Causal loop diagram



flow chart

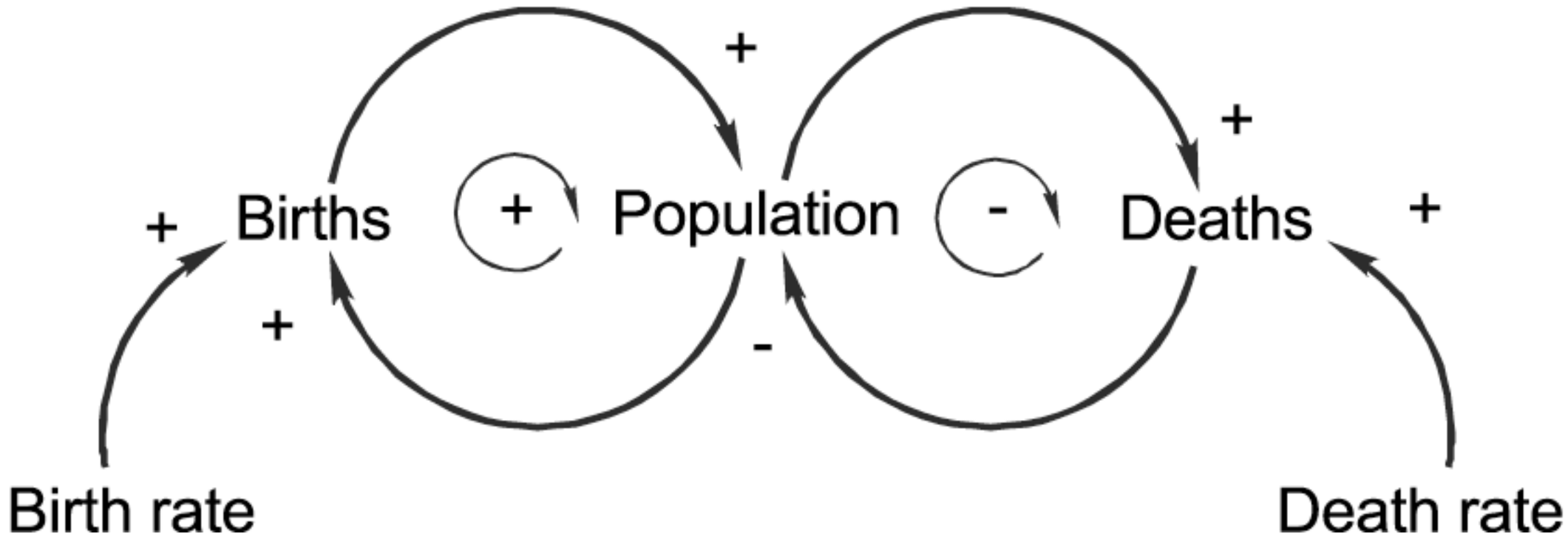
Causal loop diagram



Dynamic Problem:

The population of Canadian lynx and Snowshoe Rabbits exhibit an oscillating pattern from a time period of 1-40 years, which could lead to an imbalanced predator-prey ecosystem.

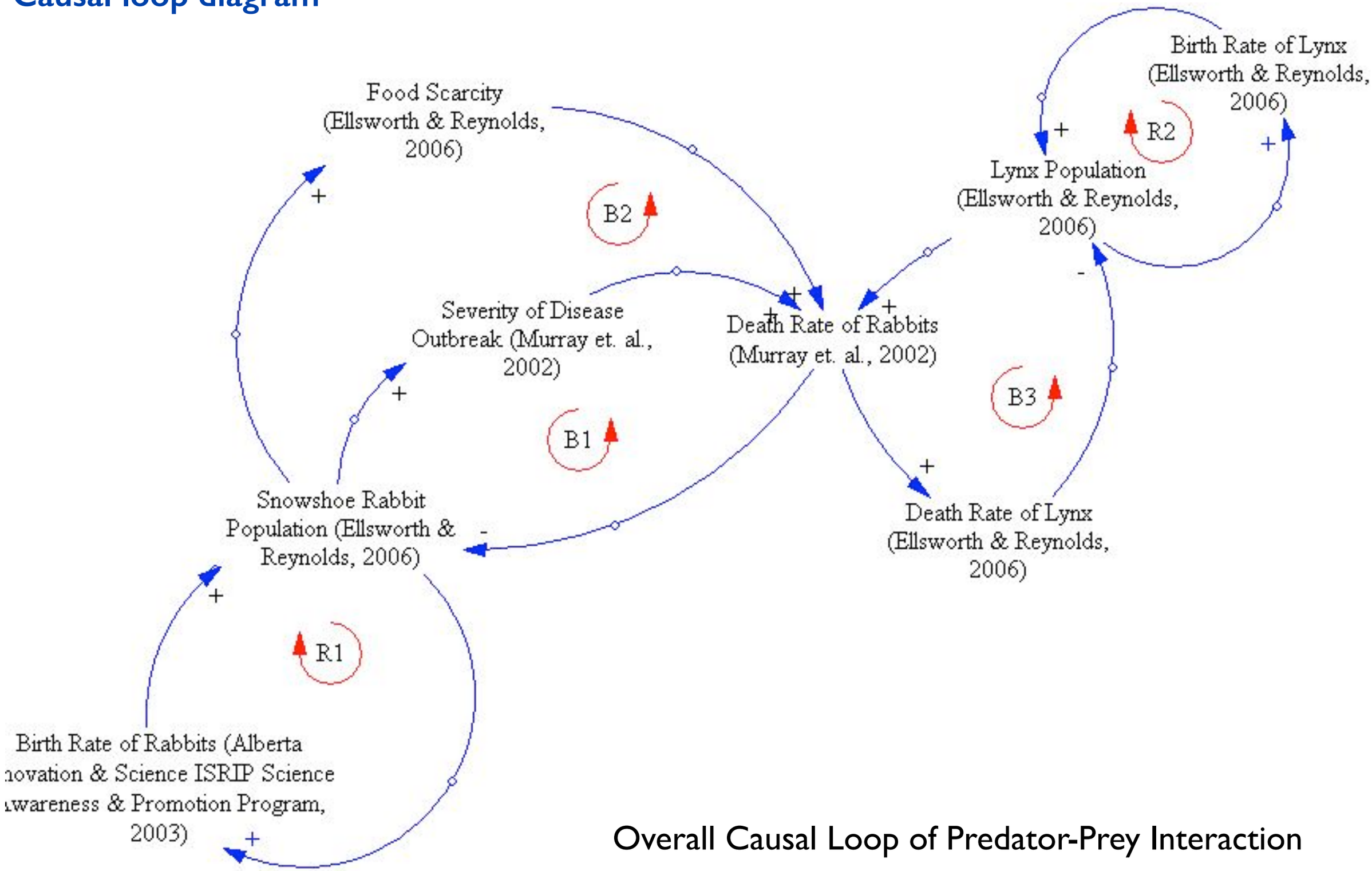
Causal loop diagram



The causal loop contains a **postive (reinforcing) loop** and a **negative (balancing) loop**. The purpose of the negative feedback is to balance the (rabbit) population.

s = same = (+)
o = opposite = (-)

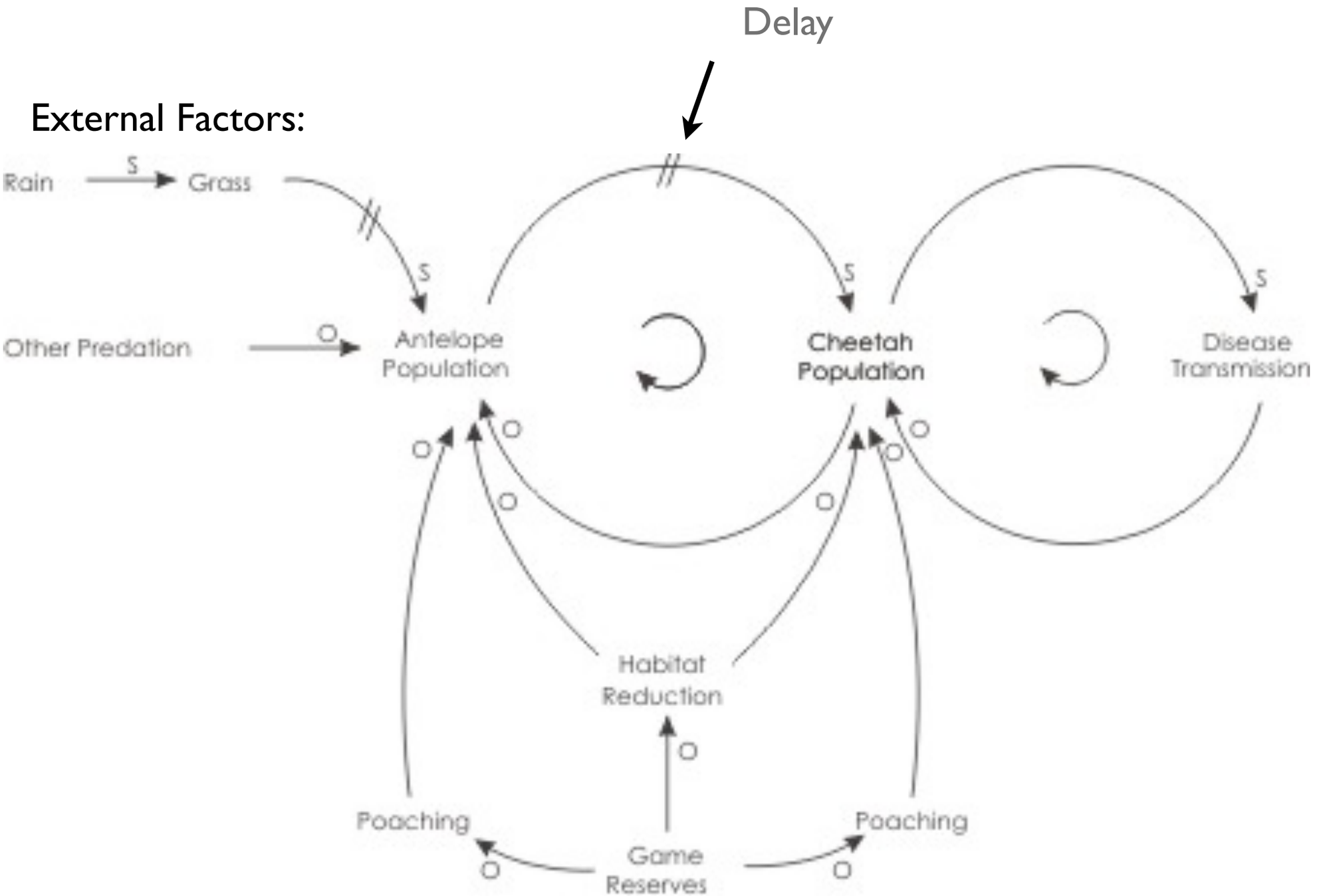
Causal loop diagram



Overall Causal Loop of Predator-Prey Interaction

http://carandang-lim.wikispaces.com/

Causal loop diagram



s = same = (+)
o = opposite = (-)

Causal loop diagram

Figure 10: Graph Showing the Adjustment in Cheetah Population in the Example in Figure 9 if there was no Delay

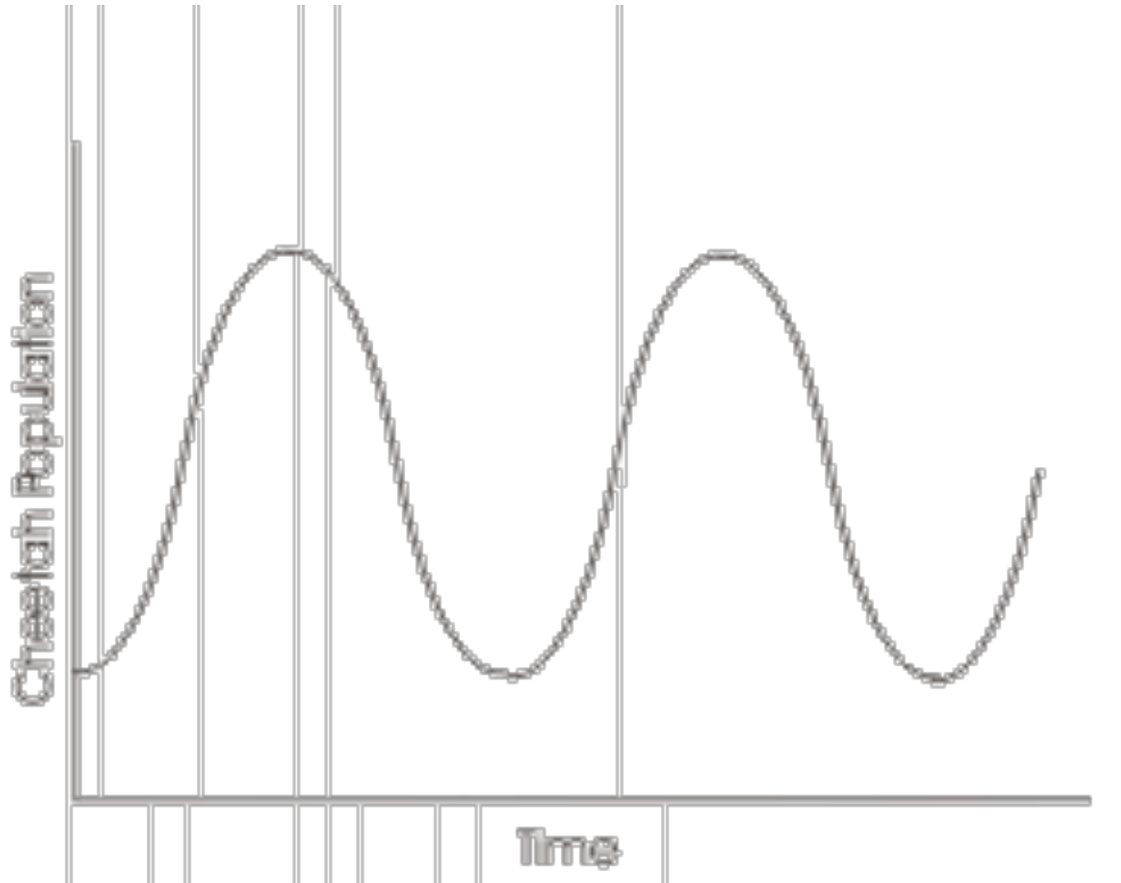


Figure 11: Graph Showing the Effect on Cheetah Populations when Delay is Considered in Figure 9.

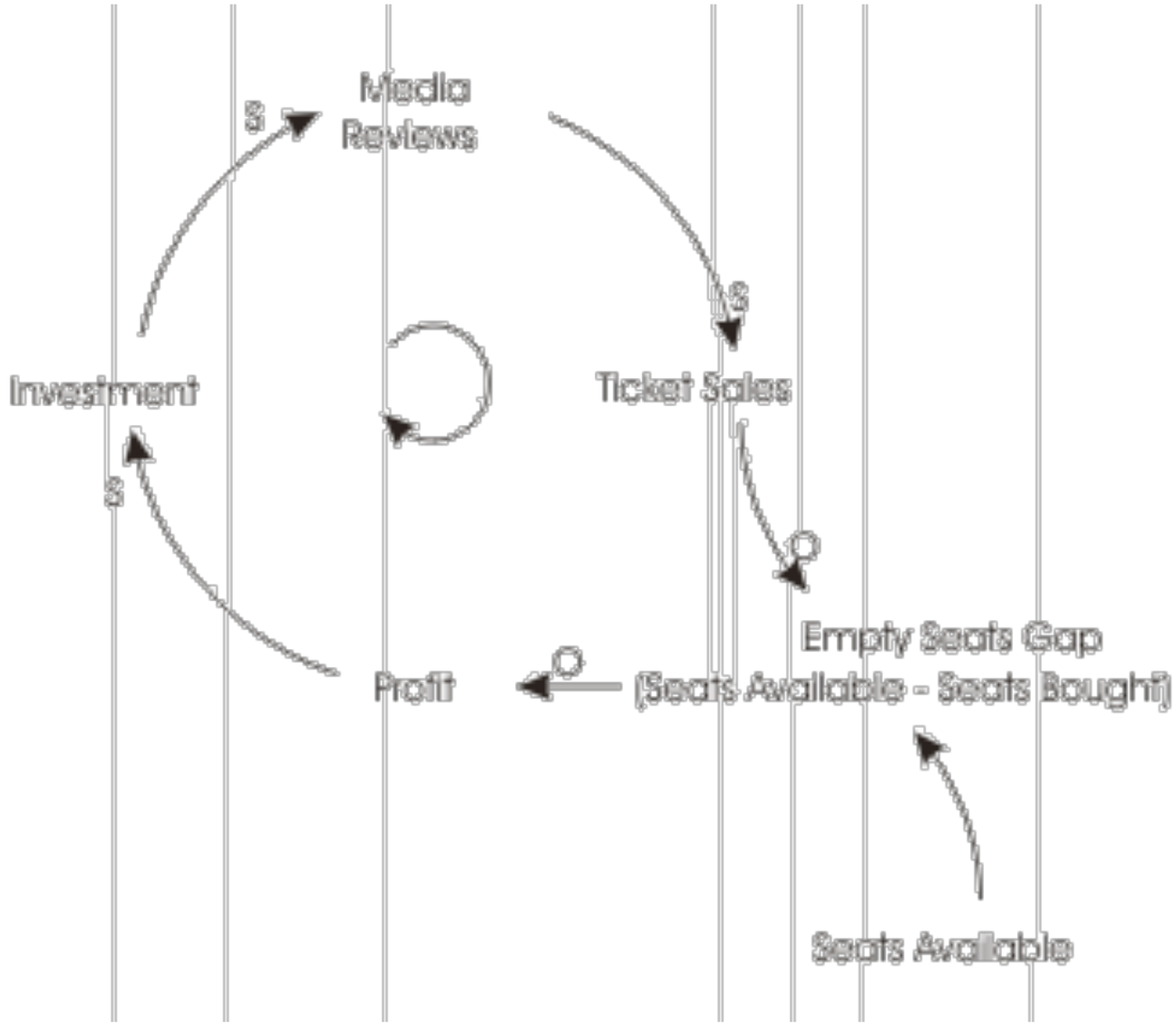
Causal loop diagram

There is a gap between the number of seats available and the number of seats used (tickets sold). As the theatre sells more tickets, the size of this gap reduces.

At a particular point it cannot sell any more tickets. Increases in investment beyond this point may not yield any more profit.

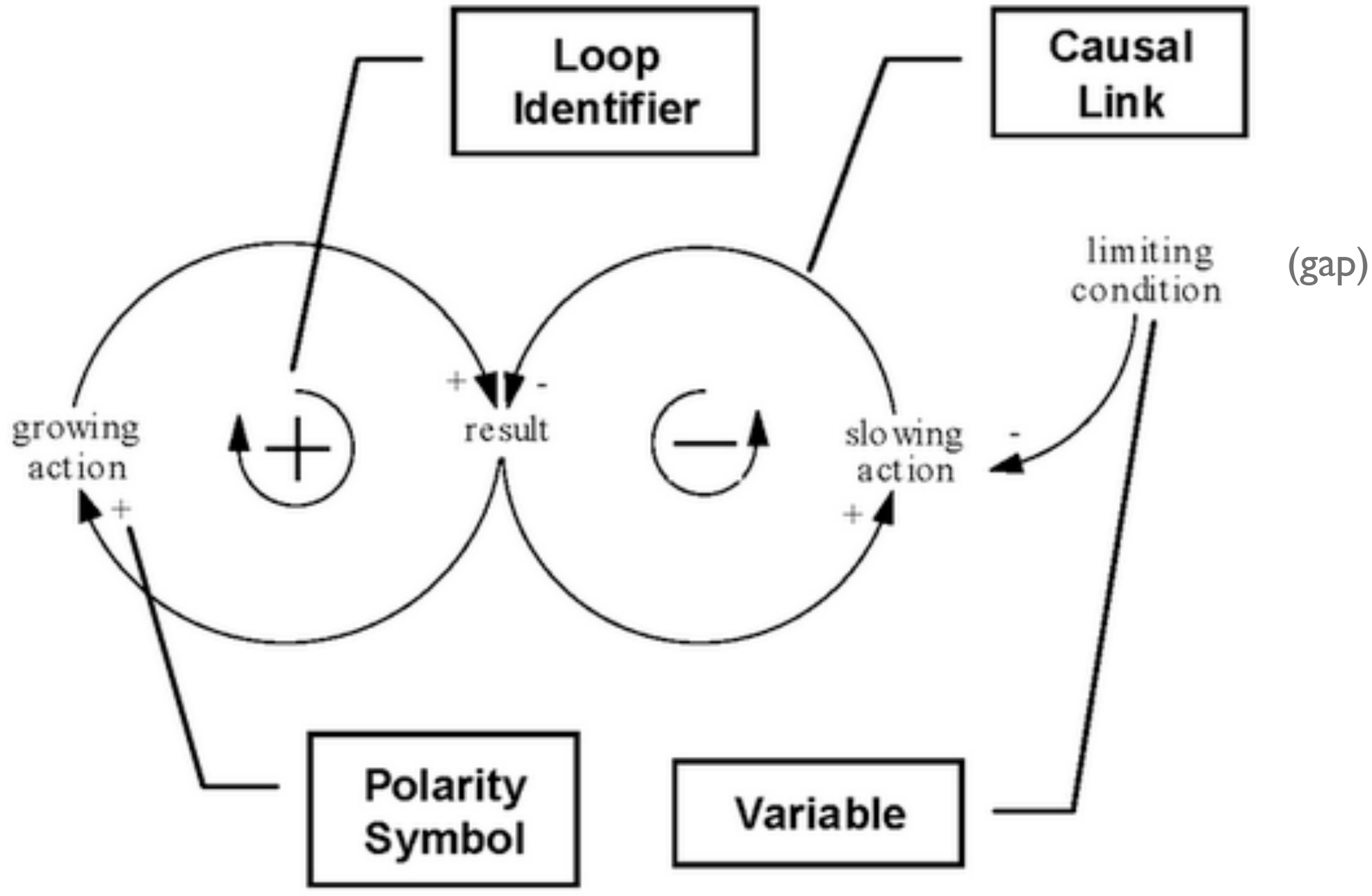
When all seats are sold, i.e. when seats available – seats bought = 0, then profit will not rise any higher unless other factors are brought into the system.

Note that it is very important to get the gap definition correct for your model.

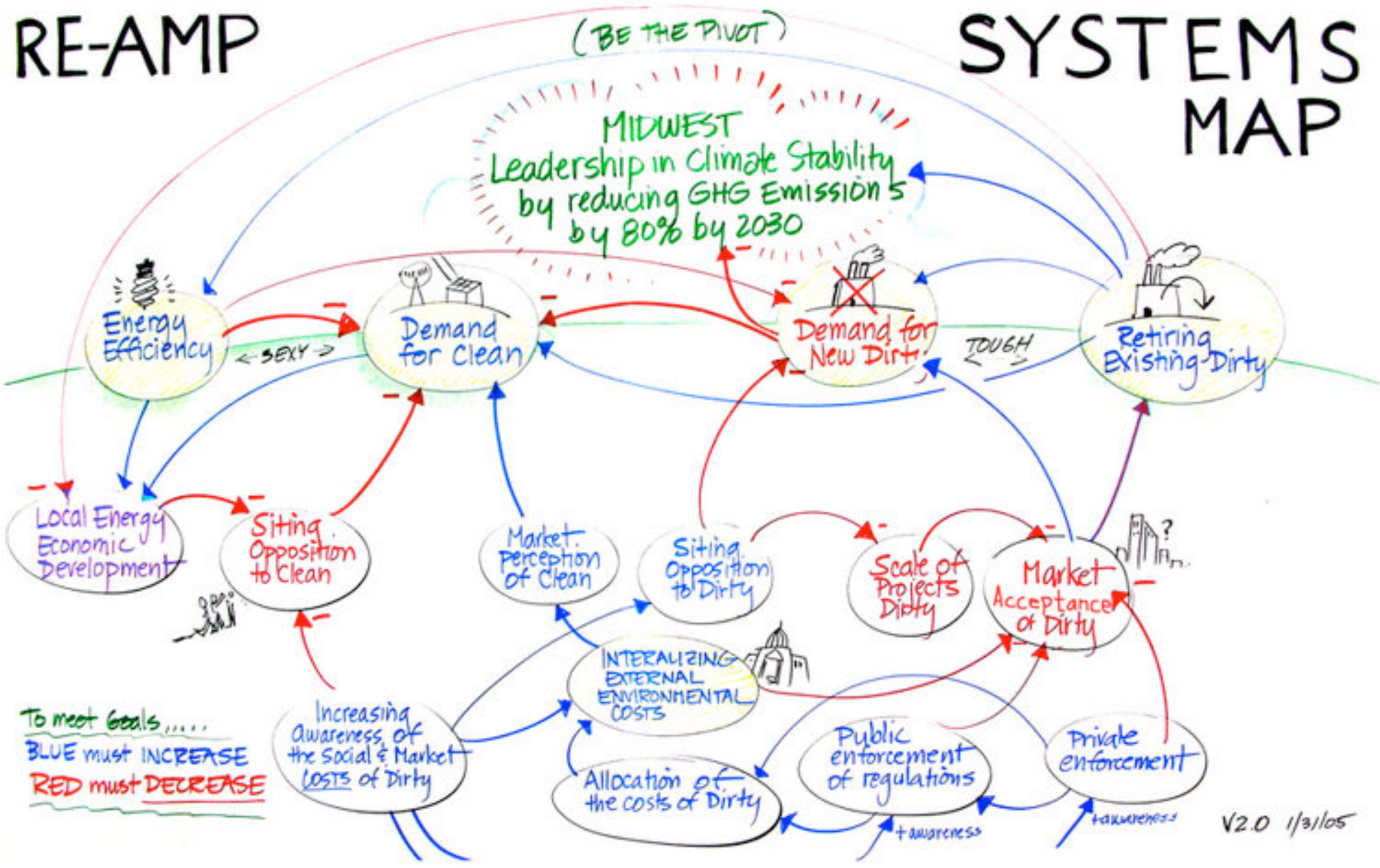


s = same = (+)
o = opposite = (-)

Causal loop diagram

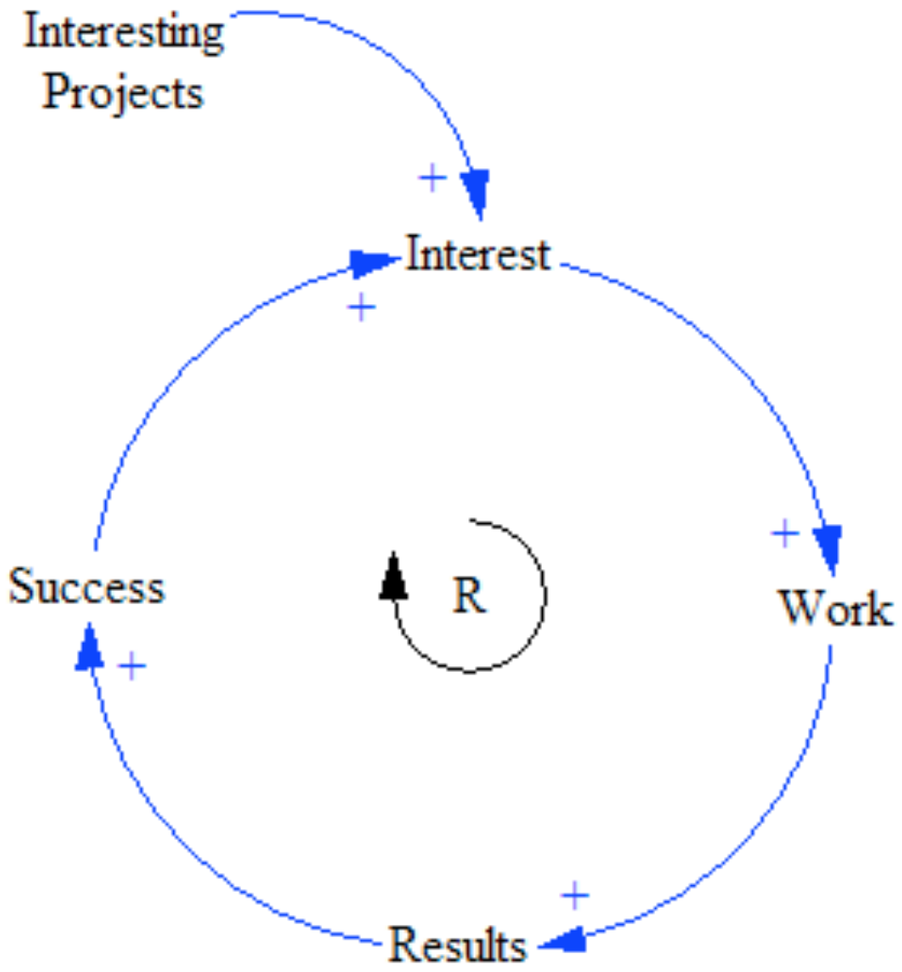


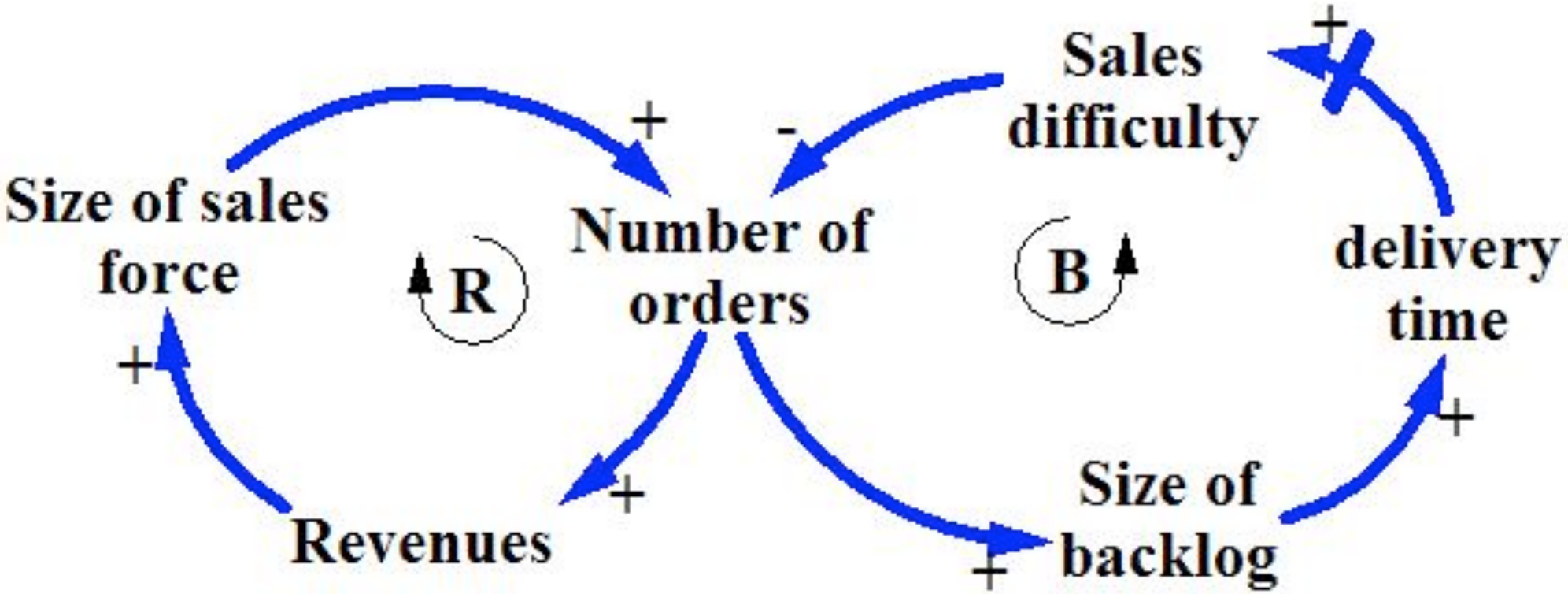
s = same = (+)
o = opposite = (-)

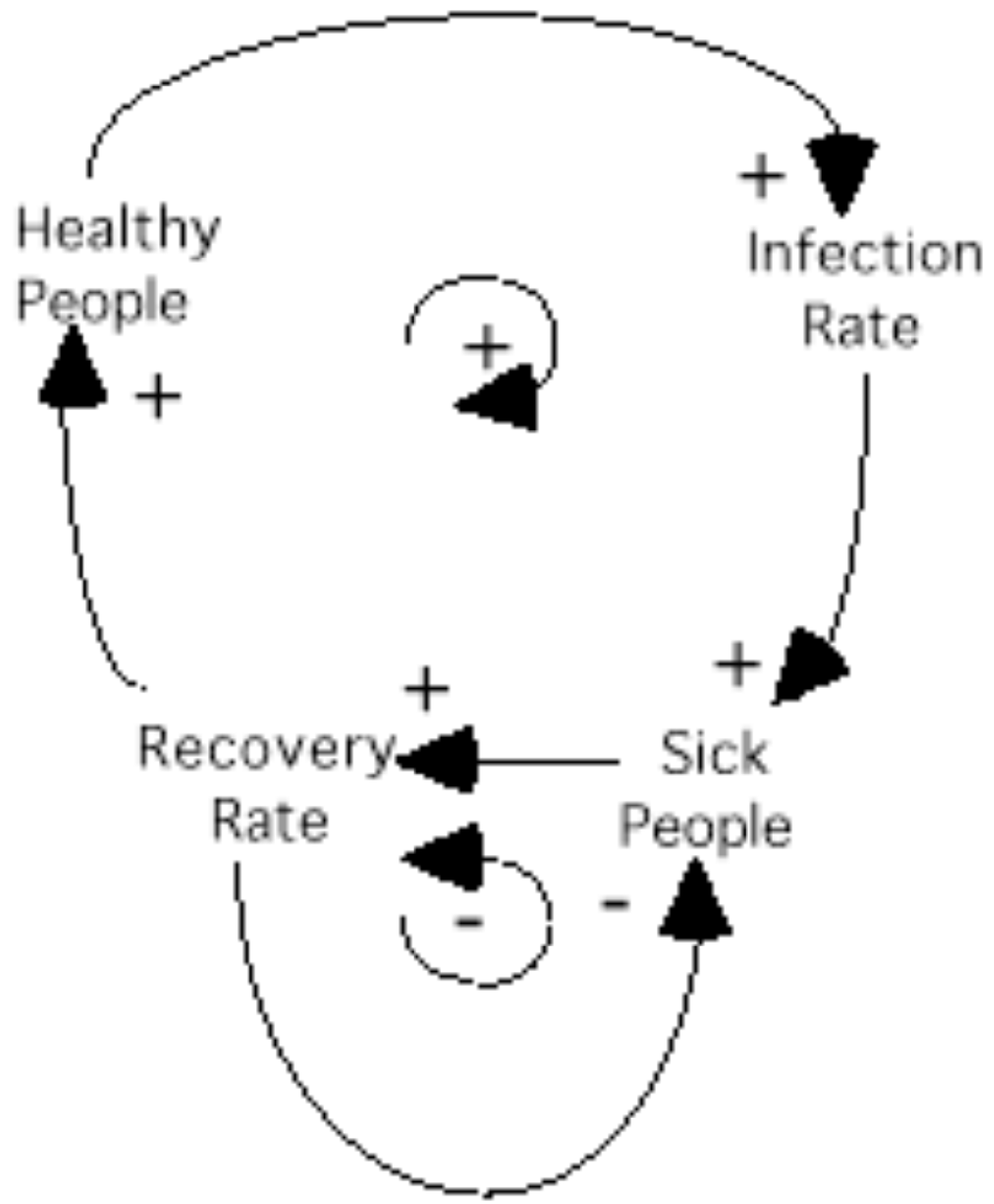

RE-AMP
SYSTEMS MAP
(BE THE PIVOT)
MIDWEST
Leadership in Climate Stability
by reducing GHG Emissions
by 80% by 2030
Energy Efficiency
Demand for Clean
Demand for New Dirty
Retiring Existing Dirty
SEXY
TOUGH
Local Energy Economic Development
Siting Opposition to Clean
Market Perception of Clean
Siting Opposition to Dirty
Scale of Projects Dirty
Market Acceptance of Dirty
INTERALIZING EXTERNAL ENVIRONMENTAL COSTS
Increasing Awareness of the Social & Market COSTS of Dirty
Allocation of the costs of Dirty
Public enforcement of regulations
Private enforcement
+awareness
+awareness
To meet Goals.....
BLUE must INCREASE
RED must DECREASE
V2.0 1/31/05

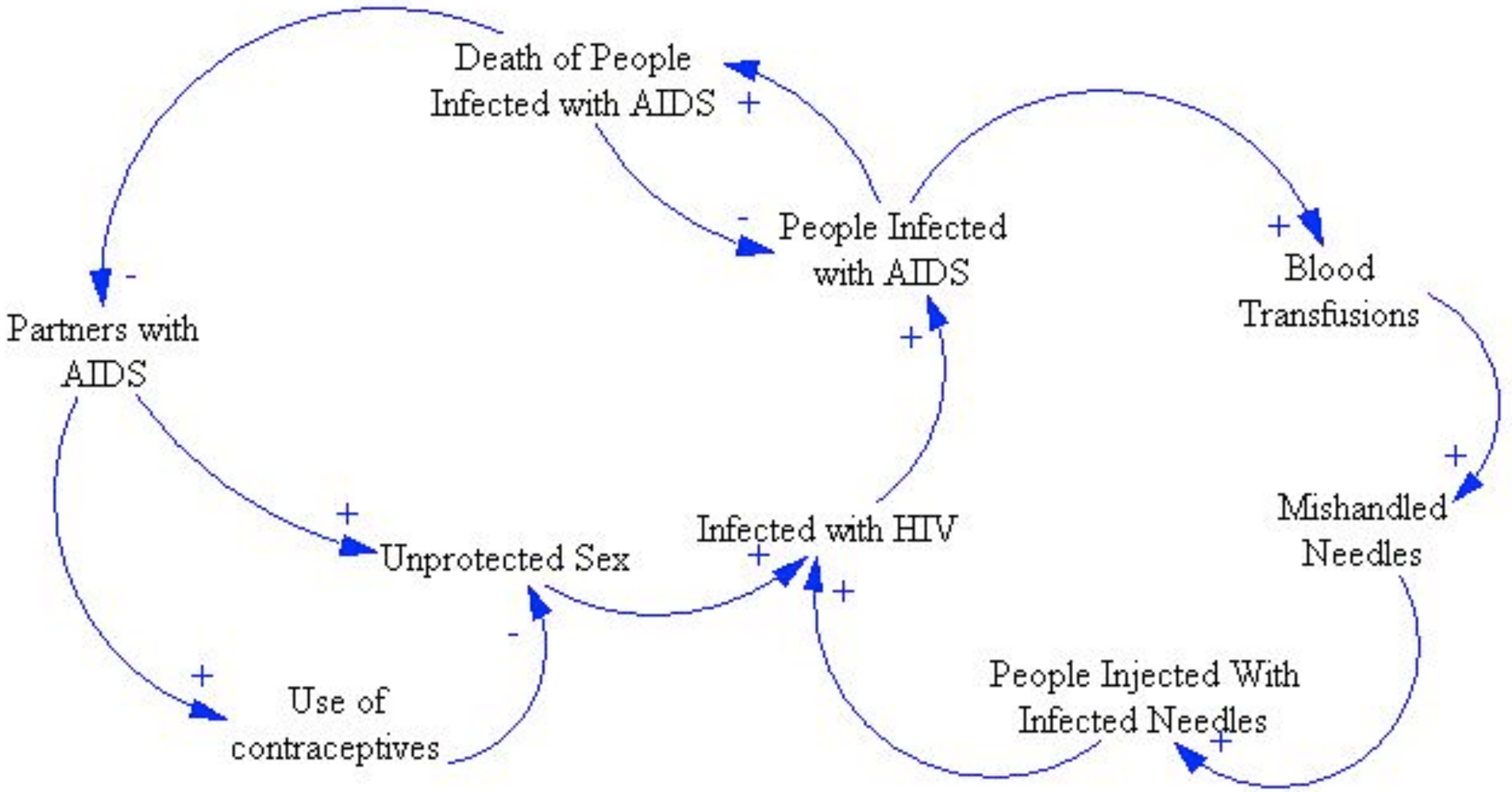
Use colors!

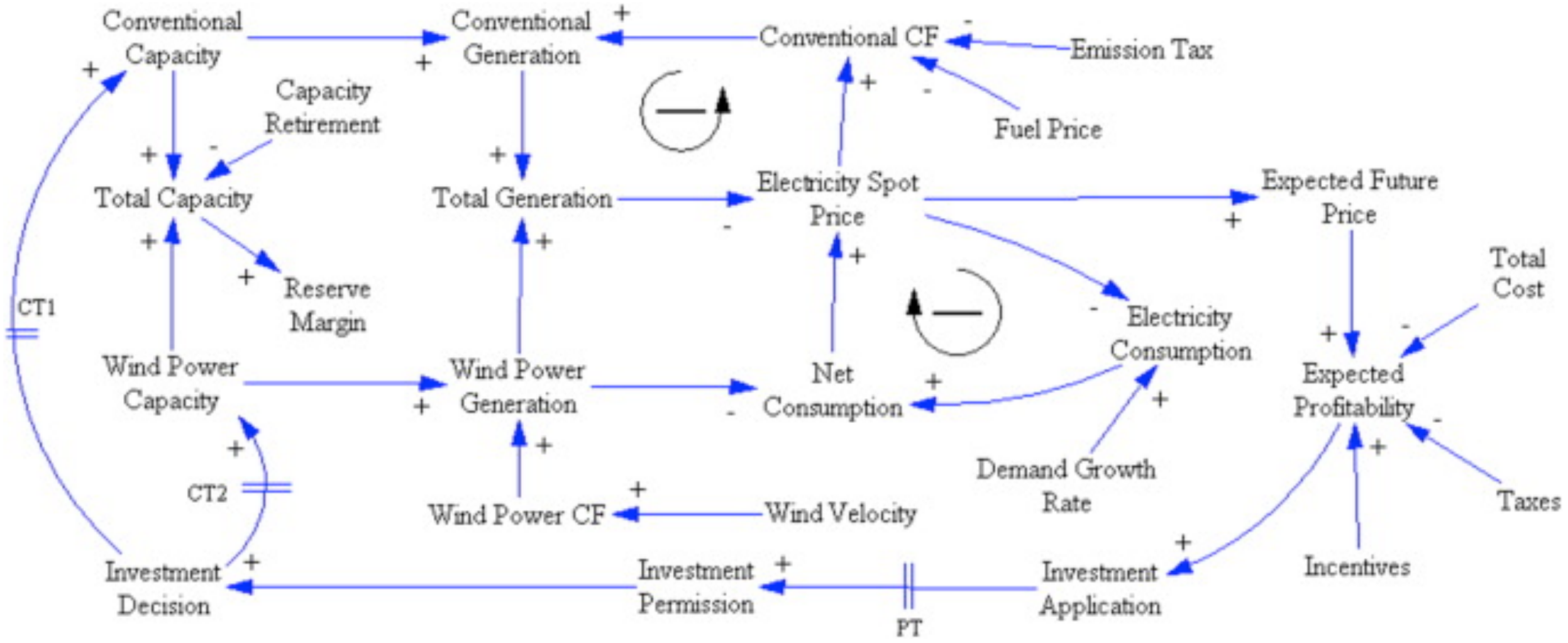
My Work Life



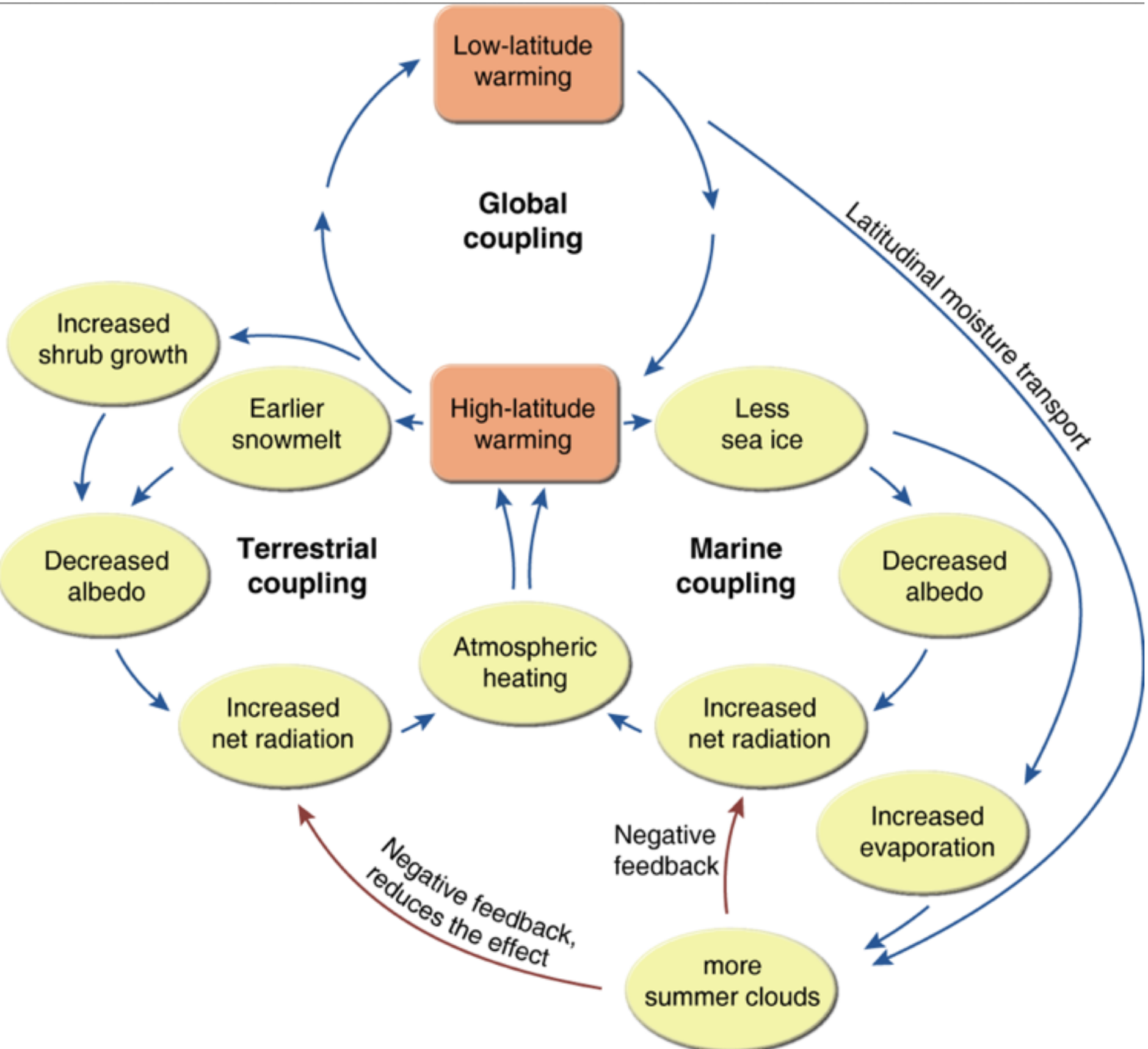

Size of sales force
+
Number of orders
+
-
Sales difficulty
+
R
B
delivery time
+
+
Revenues
+
Size of backlog
+


Healthy
People
+
+
Infection
Rate
+
+
Recovery
Rate
Sick
People
-
-

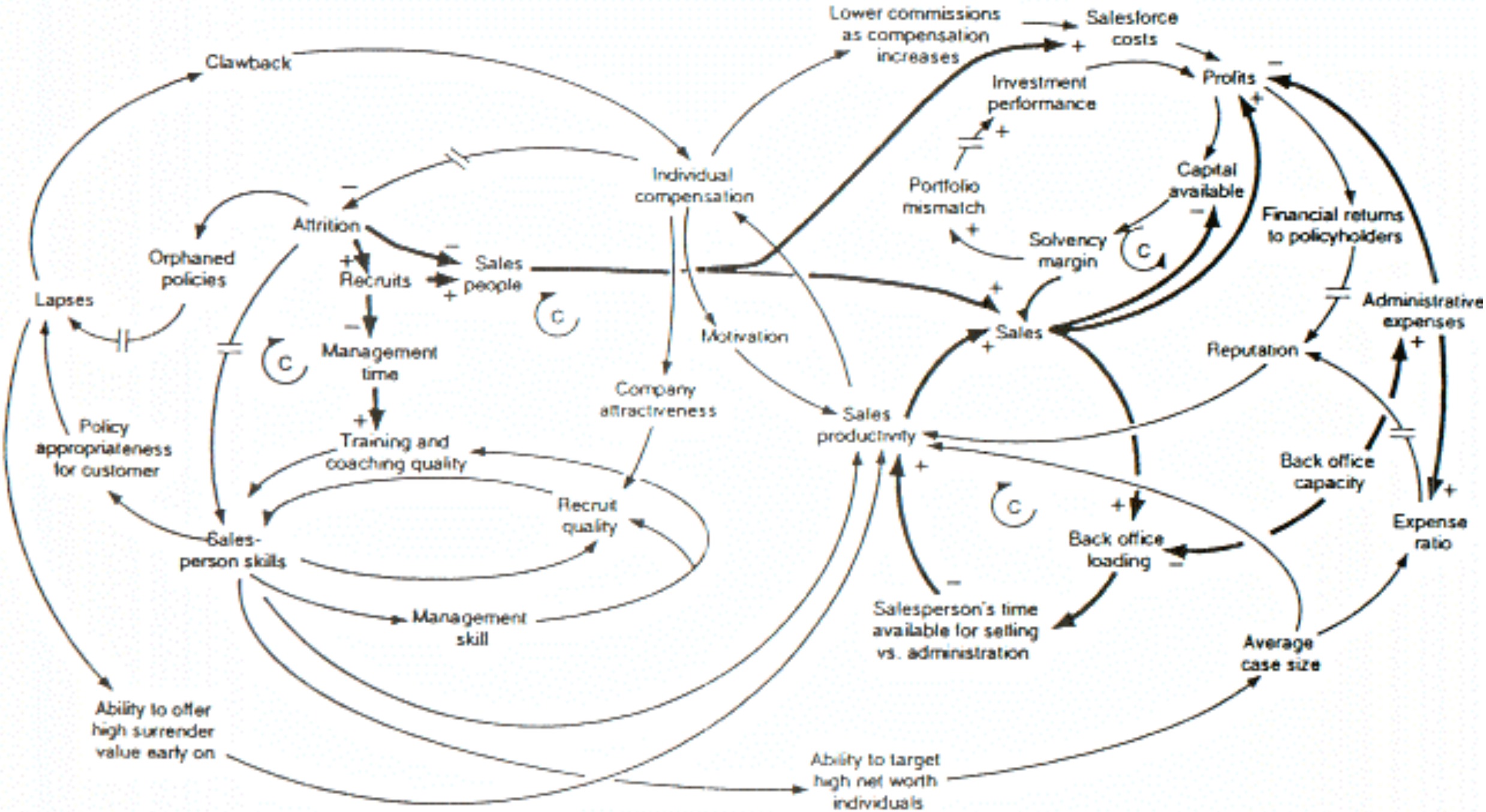

Death of People
Infected with AIDS
+
-
People Infected
with AIDS
+
Blood
Transfusions
+
Mishandled
Needles
+
People Injected With
Infected Needles
+
+
Infected with HIV
+
+
Unprotected Sex
+
-
Use of
contraceptives
+
-
Partners with
AIDS



A causal loop model for long-term assessment of power system.



CLD climate chang



Causal loop diagram of a model examining the growth or decline of a life insurance company

Key points:

Systems diagrams allow you to **model the way** in which complex systems work.

They help you to **think through the way** in which the factors within a system interact and feed back upon themselves.

You should then be able to analyze:

- **How factors are related**, and how one factor will change when another changes
- **How factors may feed back** in either balancing loops or reinforcing loops
- **How external factors impact** on the system
- **How gaps operate**
- **How delay affects** the system
- **All the complexities** of a system