How Does a System Dynamicist Think?
A case study - conceptualizing the addiction archetype

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Phrases from Recent editions of *The New York Times*

- The only thing standing between us and a quality health care system is our **addiction** to moms in the workplace.
- Most smokers are so attached to their **addiction** that they fail to recognize the “thing” they drop and step on is litter.
- Green energy and kicking our **addiction** to oil.
- The (South Korean) government plans to open rehabilitation centers for adult (internet) **addicts** and expand counseling for students and the unemployed.
- The **addiction** (to use of electronic gadgets) has blinded the family members to other pursuits.
- Marijuana's increased potency is the opening for a debate on **addiction**, treatment and legalization.
- Drug experts say there is no methadone, no silver bullet, to treat methamphetamine **addicts**.
- Alcohol **addiction** is a major problem all over the world.
Definitions

• Addiction:

• 1: dependency, dependence, habit, problem.

• 2: devotion to, dedication to, obsession with, infatuation with, passion for, love of, mania for, enslavement to.
• **Addiction to a substance:** Persistent use of a substance despite the perception that usage causes problems.
  – *Individual examples:* alcohol, crack cocaine, marijuana, coffee, sugar, tobacco, various prescription drugs both psychotrophic (ex. Valium) and physical (ex. Neosynephrin and antibiotics)
  – *Societal examples:* oil, pesticides, antibiotics in animal feed, salt in food

• **Addiction to a behavior:** Recurring compulsion to engage in some specific activity, despite harmful consequences, as deemed by the user to individual health, mental state, economic wellbeing, or social life.
  – *Individual examples:* gambling, self mutilation, violent behavior, sex internet use, video games, credit card use
  – *Social examples:* tax reduction, military force, debt, overuse of ground water, politics via disparagement, reduction of biodiversity in agriculture
Goals for this Session

- I am not trying to facilitate your becoming system dynamics simulation model builders
- I am not trying to give you a detailed model of a specific addiction
- I am hoping to engage you in a conversation that will help you understand the addiction archetype and develop teaching materials you can use with your students
Some Goals for Creating Models

• Enhance prestige
• Enhance understanding
  – Identify relevant archetypes
• Facilitate communication and education
• Design policies
  – Academic (delay the decline of the Roman empire)
  – Managerial (increase market share or profitability)
• Predict the future
Steps in Creating a Model

• Learn about the issue
• Specify common and persistent behavior patterns
• Identify stocks -> major flows
• Identify the principal feedback loops
• Write equations
• Test and refine the model
• Design changes in the model that accomplish the goals
• Develop the educational and political program that will cause the real system to change in the desirable ways.
Common Behaviors

• Compulsive and repetitive (often escalating) use despite the perception of problems.
• Tolerance to the effect of the behavior and withdrawal symptoms when use is reduced or stopped.
• Self-destruction
Adaptation

Problem

Health of the System

Change in Health

Perceived Health

Desired Health

Delay Consequences

Action

Consequences

Gap
Adaptive Behavior

Desired Health

Actual Health

Problem

Action
Addiction

Problem

Health of the System

Change in Health

Perceived Health

Desired Health

Gap

Action

Delayed Consequences

Consequences

(R)

(B)

Desired Health
Addiction with Eroding Goals

Problem
Health of the System
Change in Health
Perceived Health
Desired Health
Gap
Delayes Consequences
Decay
Consequences
Action

(R)
(B)
Changing the Structure: Moving from Addiction to Adaptation - 1

• Widen your view – understand the structure
• Lengthen your time horizon – do not focus only on the short-term improvement in perceived health
• Measure real health
• Avoid drifting goals
• Create new feedback links
Changing the Structure: Moving from Addiction to Adaptation - 2

• Understand the dynamics of withdrawal
• Create an early warning system
• Establish a long-term plan for withdrawal
• Address the true costs of addiction
• Cultivate a culture of abstinence
• Get help