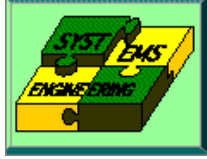
George Mason University



SYST 101: Intro to Systems

Lecture 17

Mar. 25, 2003

C. Wells, SEOR Dept.

Announcements

- Remaining Semester Schedule
  - Mar 27 lecture 18
  - Apr 1, 3 lecture 19, 20
  - Apr 8, 10 Project 2 laboratory testing
  - Apr 15, 17 lecture 23, 24
  - Apr 22, 24 Project 2 demos and oral presentations
  - Apr 29, May 1 Review for final
  - May 2 SYST 490/495 presentations
  - May 13 Final Exam 10:30 – 1:15

Announcements cont.

- Central Module lab open most evenings.
  - There are almost always graduate students there.
  - Front door should be open till 9 pm.
  - Course is set up halfway.
  - Arrangements can be made for weekends.
    - But contact me or Ning during the week.

Agenda

- Models (cont)

Model - Definition

- A model is a representation of some entity.
- A model can be an entity
- The entity does not have to actually exist.
- The model itself does not have to have physical existence.

WARNING!

- Models are not reality
  - They represent reality
  - They are simplistic
  - They are erroneous (but may be good enough)
- The problems we encounter in system engineering are really problems in the adequacy of our models

Creative Tasks

- Most creative tasks are involved in making models
  - Models are the first guess
  - Refined models are the result of analysis, interpretation and revision
- Always the question of adequacy of the model

Engineering is ---

- a creative process
- usually involved in making models of things for others to make
- not usually involved with making things
  - Technicians and manufacturers make things

Two Flavors of Models

- The “pre-reality” model
  - exists before an entity
  - used in creating an entity
  - used in understanding a hypothetical entity
- The “post-reality” model
  - exists after the entity exists
  - used in understanding a real entity

Adequacy

- The problem of adequacy is exposed when we attempt to make the “entity”
  - The realized model does not match expectations
- The problem of adequacy is exposed when we attempt to model reality
  - The model’s behavior does not match reality

Risk

- There is risk whenever we go between a modeled universe and the real universe
- Not just in engineering
  - Psychology
  - Interpersonal interactions
  - Artistic activities

Examples

- Mental models
  - Evaluation of universe
  - Expectations of people
  - Behavior of people
  - System performance
  - Organizational performance
  - Communication
- We constantly create and modify mental models based on our experiences

Examples (cont.)

- Physical models
  - Descriptive
  - Evaluation
- Mathematical models
- Linguistic models

Communication

- Concepts are our mental models
  - The problem is transferring them to others
  - Models can represent concepts
- Books
  - Fiction and non-fiction
- Plans
  - Schedules
  - Blue prints

Understand Where You Stand

- Engineers live largely in a model world
  - We are “knowledge” workers
  - Our concepts, analysis, and interpretation are all model based
  - We use “models” to communicate our “knowledge” work to others
- Others usually make the models into real entities

What Is Reality

- A model represents an entity, but an entity can be a model
- Knowledge workers can be confused
  - For knowledge workers, your concepts (models) are what they hire you for
  - but their representations (models) are the products (entities) they get
  - Will an implementation (reality) perform as expected?

Assignments

- Reading
  - Petroski, Invention by Design Chapters 8 & 9
    - "Water and Society"
    - "Bridges and Politics"
- Homework
  - none