Faculty of Computers and Information
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Modeling and Simulation

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Lecture Contents

- **Concepts of Modeling**
- **Types of models**
- **Modeling of Systems**

Concepts of Modeling

A model is a simplified representation of a system intended to enhance our ability to understand, predict, and possibly control the behavior of the system

Concepts of Modeling

- **represents the most system components and the way they interact.**
- **An abstraction or an approximation that is used to represent reality**

Concepts of Modeling

- **A model is something that we use to represent the real system in order to understand something about that system**
- **Models give us comprehensible representations of systems**

Concepts of Modeling

- **Models are something to think about**
- **Models are something to communicate about (Systems have inputs and outputs)**
- **A model is a *static* representation of the system**

Concepts of Modeling

- **A collection of symbols and ideas that approximately represent the functional relationship of the elements in a system.**
- **"A model is a description of some system intended to predict and what happens if certain actions are taken"**
- **Construct a conceptual framework that describes a system**

Concepts of Modeling

Examples:

- **Queuing models: queues, servers, arrival times, service times, distributions.**
- **Network models: nodes, links, traveling times, capacities.**

Types of models

Examples:

- **Narrative**
- **Physical**

(Like a model of house, bridge, Car, prototypes, …etc)

- **Schematic**

(Like maps and graphs)

Types of models

Examples:

- **Mathematical**
- **Mental**

(Like personal view of a foreign country, or an event or object)

- **Symbolic**

(Like words (as in newspaper) and pictures)

Modeling of systems

- **System**
  - **A set of elements or components that interact to accomplish goals.**
  - **A combination of components working together.**

Modeling of systems

- **System**
  - **A collection of entities (people, parts, messages, machines, servers, …) that act and interact together toward some end (Schmidt and Taylor, 1970)**

Modeling of systems

A system is a part of some potential reality where we are concerned with space-time effects and casual relationships among parts of the system

Modeling of systems

A system is groups of objects that are joined together in some regular interaction toward the accomplishment of some purpose.

Modeling of systems

For example:

- **An automobile factory: Machines, components parts and workers operate jointly along assembly line**

Modeling of systems

- **Defining a system requires setting boundaries**
- **separates system from rest of the universe**
- **makes the system a *closed world***

Modeling of systems

- **System boundary**

Defines the system and distinguishes it from everything else.

Modeling of systems

System Elements

- **Inputs**
- **Processing mechanisms**
- **Outputs**

- **Modeling is done for the Processing step**

Modeling of systems

System types

- **Simple vs. complex**
- **Open vs. closed**
- **Stable vs. dynamic**
- **Adaptive vs. nonadaptive**
- **Permanent vs. temporary**

Modeling of systems

- **Efficiency**

A measure of what is produced divided by what is consumed.

- **Effectiveness**

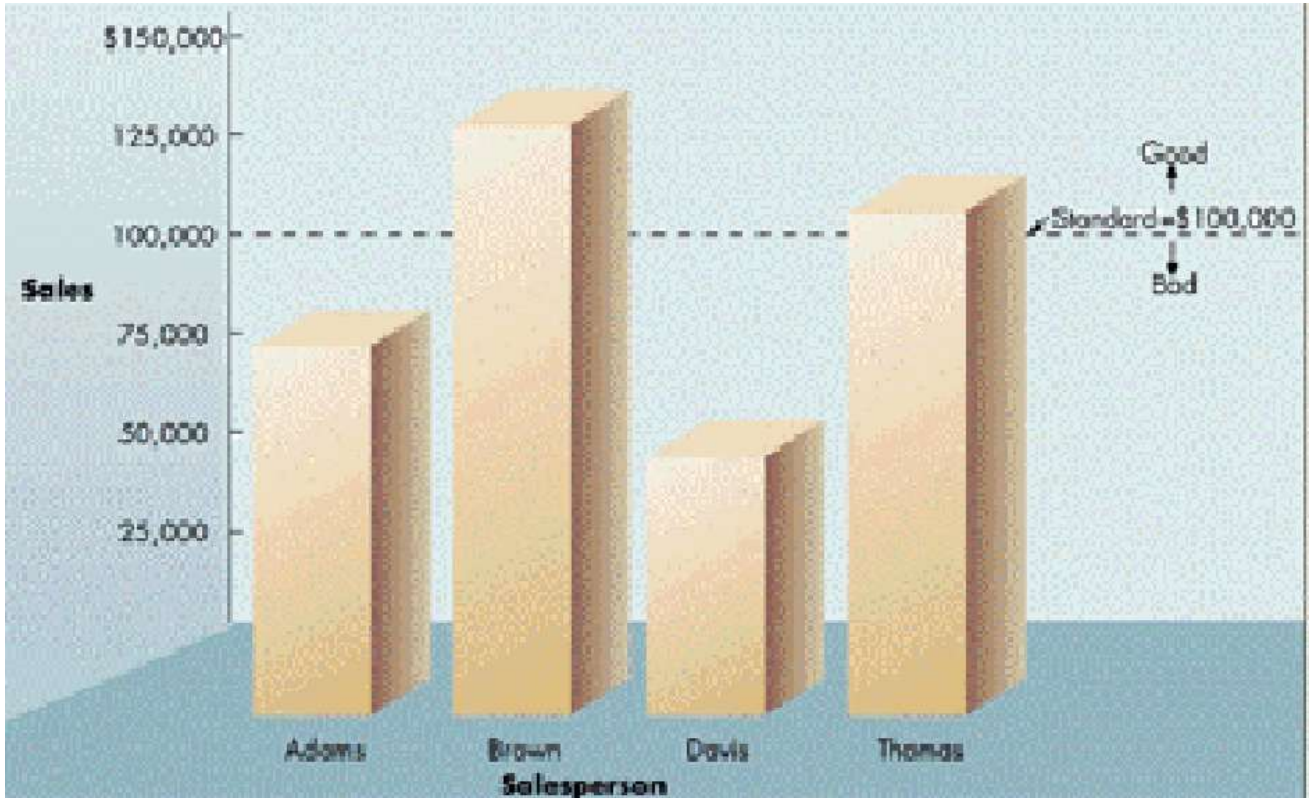
A measure of the extent to which a system achieves its goals.

Modeling of systems

- **System performance standard**

A specific objective of the system.

Modeling of systems



Modeling of systems