Introduction to Operations and how to Manage

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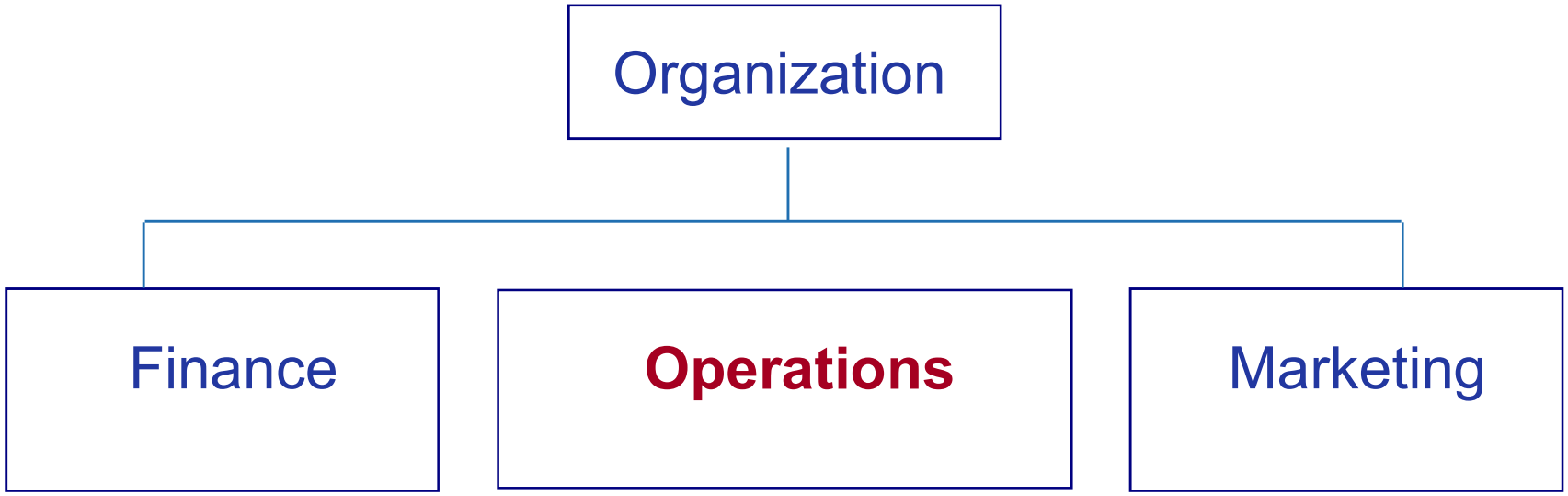
Operations in the Business Organization

Operations (often abbreviated to *Ops*) is one of the 3 basic functions of a business organization (and these business areas overlap).



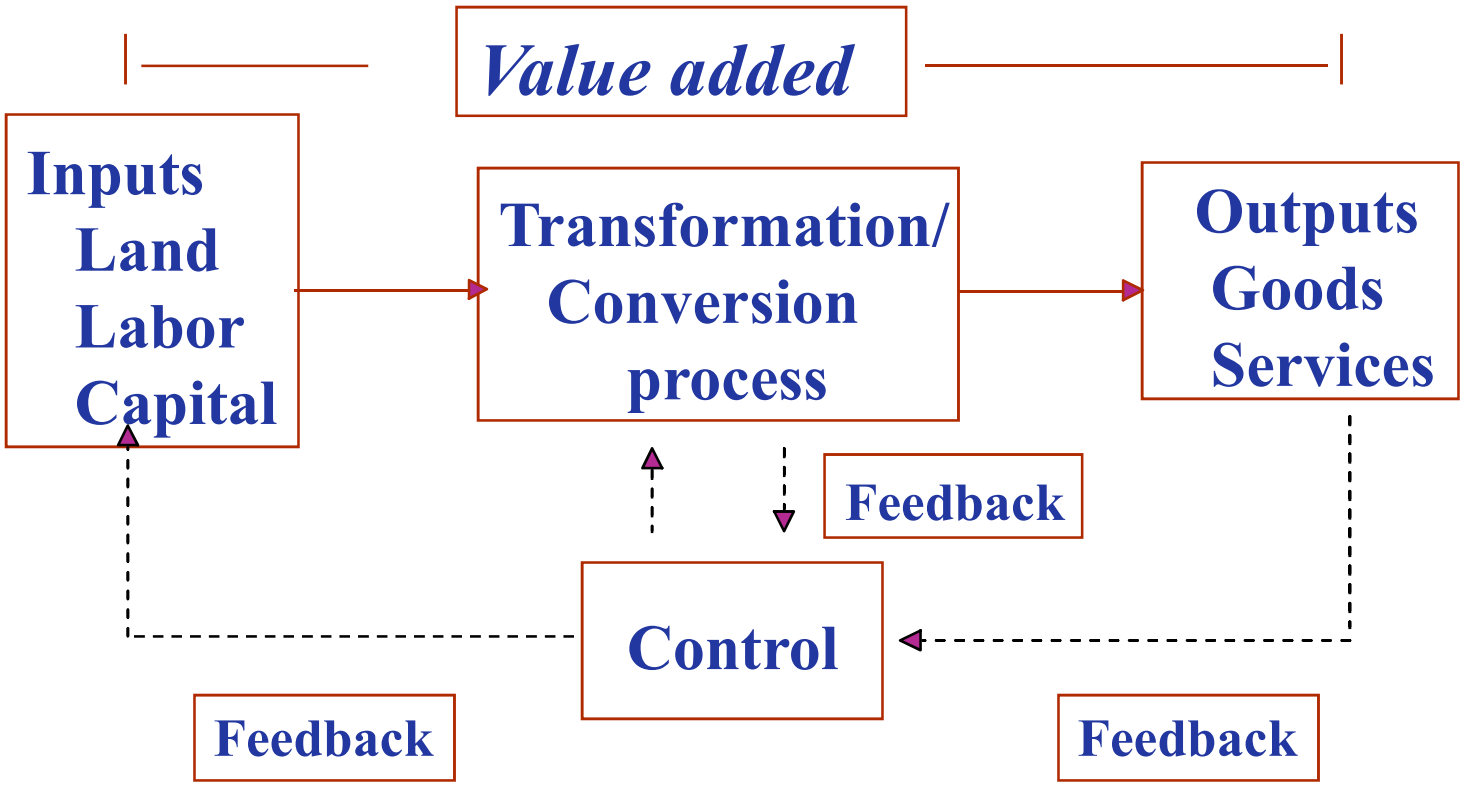
Operations Management (or Analysis) concerns studying the processes and systems used to create goods and/or provide services and making them run smoothly

Types of Operations

Operations	Some Examples
Goods Producing	Farming, mining, construction, manufacturing, power generation
Storage/Transportation	Warehousing, trucking, airlines taxis, buses,
Exchange	Retailing, wholesaling, banking, leasing
Entertainment & Communication	Films, radio and television, concerts, recordings
Service/Hospitality	Hotels, restaurants, tours conferences/events

The Operations Function Converts Inputs to Outputs

Value Added: The difference between the cost of inputs and the value or price of outputs.



Goods: Food Manufacturer

Inputs	Processing	Outputs
Raw Vegetables	Cleaning	Canned vegetables
Metal Sheets	Making cans	
Water	Cutting	
Energy	Cooking	
Labor	Packing	
Building	Labeling	
Equipment		

Service: Hospital

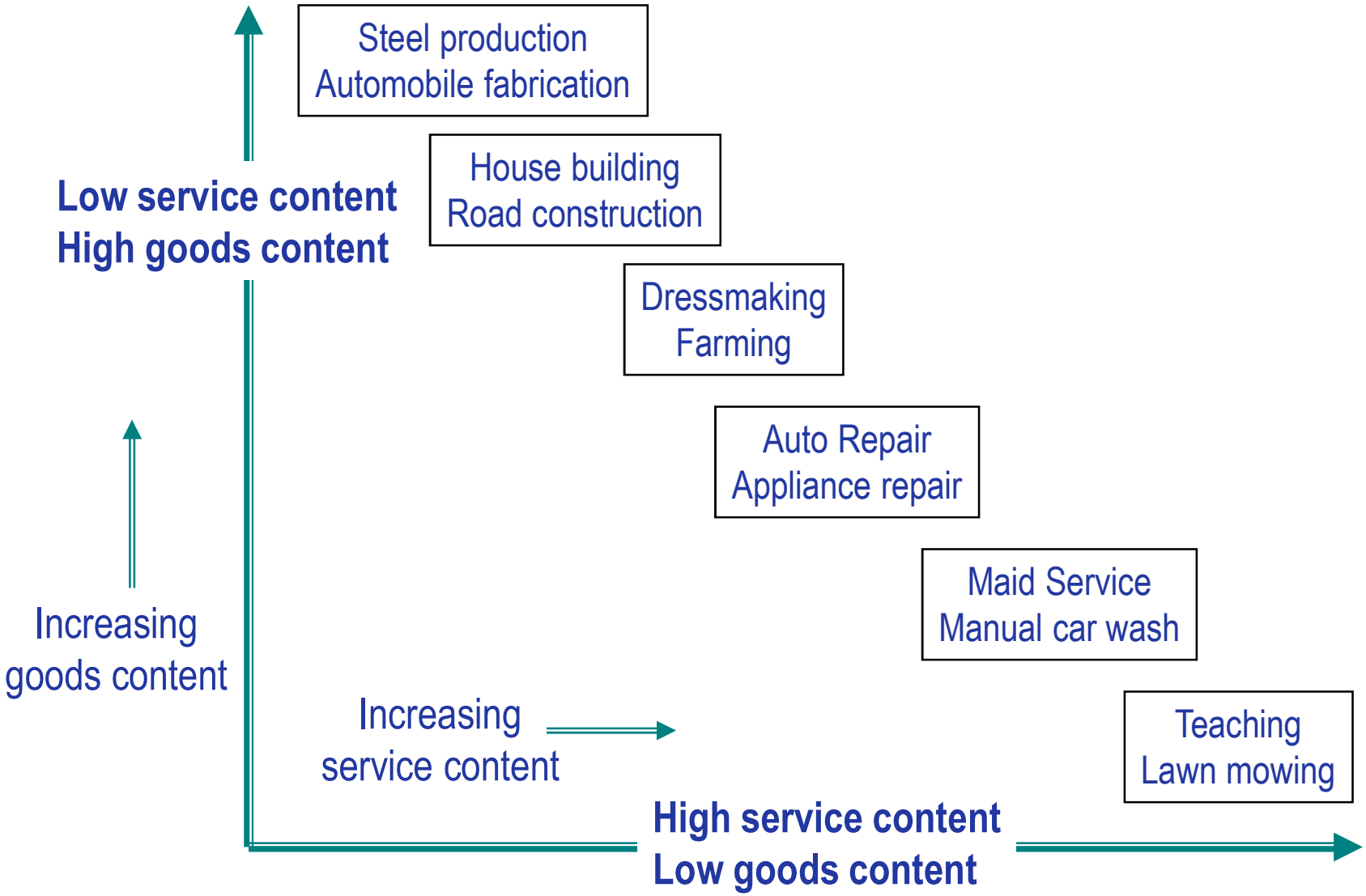
Inputs	Processing	Outputs
Doctors, nurses Hospital Medical Supplies Equipment Laboratories	Examination Surgery Monitoring Medication Therapy	Healthy(er) patients

Sick/Concerned Patients

Manufacturing vs. Service

Characteristic	Manufacturing	Service
Output	Tangible	Intangible
Customer contact	Low	High
Uniformity of input	High	Low
Labor content	Low	High
Uniformity of output	High	Low
Measurement of productivity	Easy	Difficult
Opportunity to correct quality problems	High	Low

Goods-Service Continuum



Manufacturing vs. Services ???

- These differences are beginning to blur in many cases
  - Software companies sell service contracts and bill out consultants
  - Health clubs & salons sell products, some of which are their own brands
- Many companies have shifted what they do
  - IBM 1970's- production of mainframes and electronic equipment
  - IBM today- much of their revenue is from services and consulting

Quantitative Approaches
Math, Statistics, and Computers

- Operations Managers need more than common sense and “rules of thumb”
- Using quantitative methods for problem solving: attempting to find a *mathematical* solution to a *managerial* problem
  - Computer power in the late 1900’s made this possible
- Below are *some* of the tools used by Operations Managers to assist in decision making that we will learn.
  - Forecasting: Smoothing Filters and Regression Analysis
  - Capacity Planning: Breakeven analysis
  - Linear Programming: LP Formulations and Sensitivity Analysis
  - Inventory: Economic Order Quantities and Re-Order Points
  - Quality Management: Control Charts
  - Project Management: Activity-on-Node planning networks

Models in Operations Analysis

- A *model* is an abstraction of reality used to better understand and predict the real life phenomena
  - We will use Schematic Models (e.g. flow diagrams, charts) and Mathematical Models (e.g. formulae, spreadsheets) in this class
- Models are simplified versions of the problem
  - Often are used to understand and address the most crucial aspects of the problem
    - Pareto Effect- 80% of the problem is usually caused by 20% of the activities
  - Less cluttering data makes problem easier to understand
  - Adding complexity is not always helpful. (KISS principle)

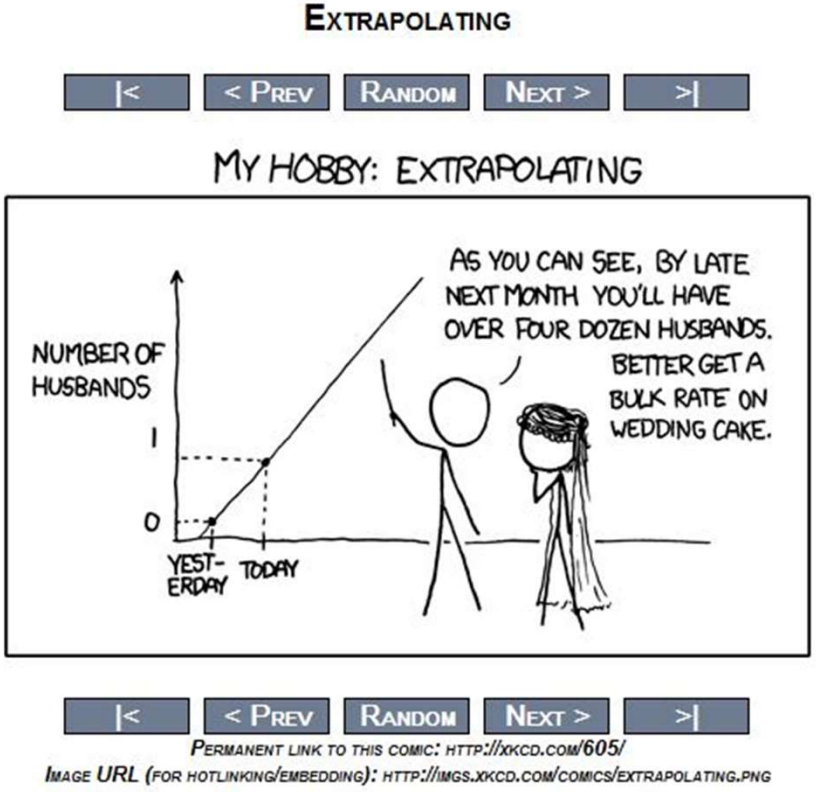
Why Use Models?

1. A systematic approach to problem solving
   - Should be able to get consistent, reproducible results
   - Math is better than politics!
2. Cheaper (and quicker) to build a model that make changes in the real world
   - With computer is easier to find an optimal solution for problems with lots of data
   - We can evaluate *what-if* scenarios
3. Increases understanding of problem
   - Provides a standardized format for understanding problem
   - Requires users to organize and quantify information that might otherwise be unidentified
   - Requires users to identify specific objectives

Model Limitations

- Because a model is a simplified version, it may not completely describe reality
  - Ignore all the real life details, but some of these may be relevant
  - Even Newton's famous gravity model ($d = gt^2$) breaks at the sub-atomic level

- Models may fall into the hands of untrained users who misuse and misinterpret them (eg. the xkcd cartoon)



To Use (or Build) a Model Properly…

- It is important to know (or if you are building the model, to state) the following…
  1. Model Purpose
     - What is the scope of the model? (Don't try to answer questions not in the scope!)
     - Eg. Are we deciding how many iPhones to produce this quarter, or are we taking that amount as fixed (beyond our control!) and optimizing the production schedule within the quarter?
  2. Proper use of model
     - What time-frame are the results valid for? Can we project demand 5 years out, or only the next few quarters?
  3. How results are interpreted
     - Eg. Do we round up or round down for integer solutions?
  4. What assumptions and limitations apply?
     - E.g.: linear cost functions, constant scalability, any setup or transition delays?