

MGB 206: Decision Making and Management Science



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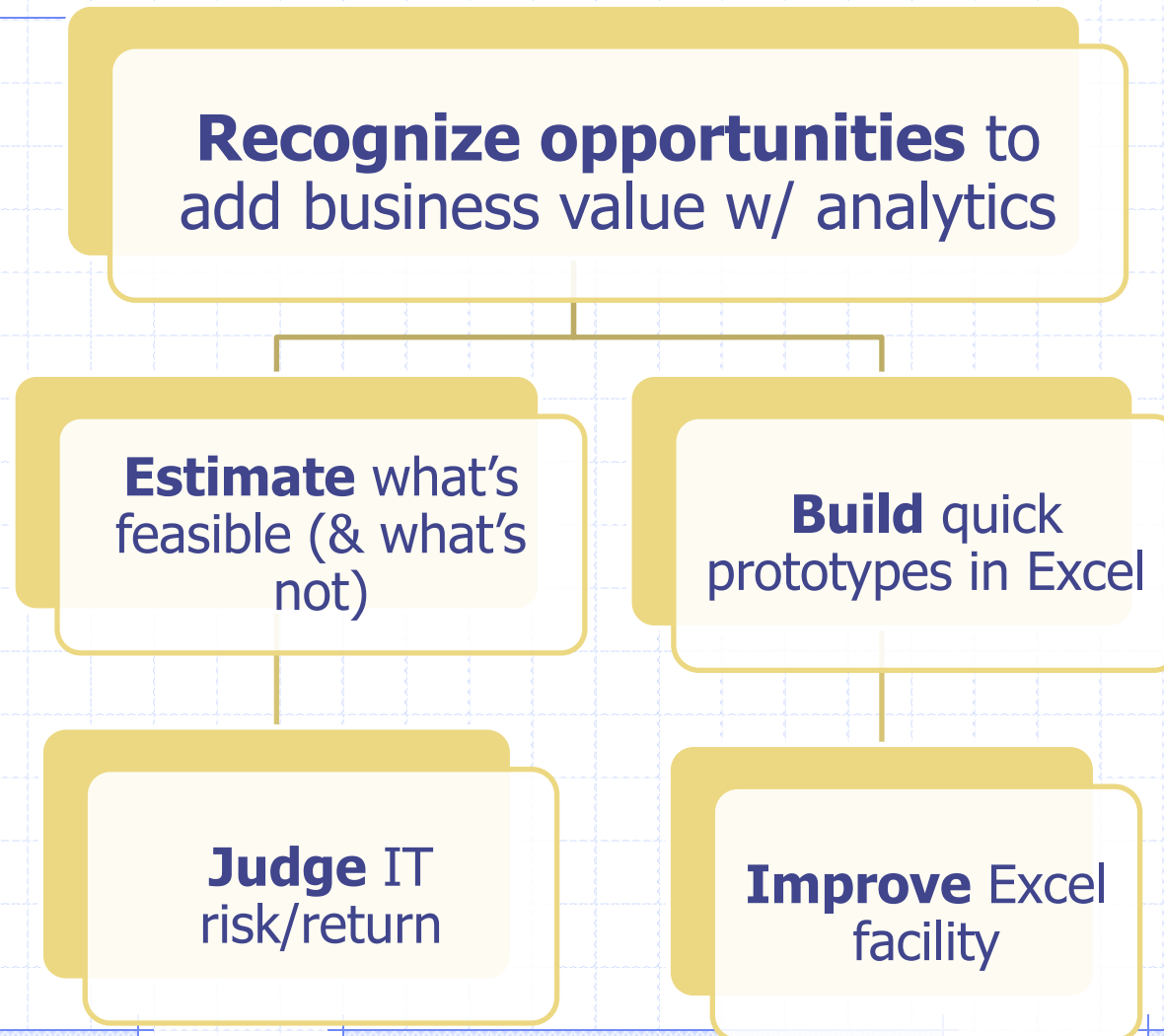
Motivation

- Business leaders need to understand the tight interplay of information and business operations in today's environment
- We can cover enough of this rich field, in enough depth, to provide a solid Analytics foundation for your managerial roles

What We'll Cover

- Learn Management Science techniques
 - Simulation
 - Decision Analysis
 - Optimization
- Use Excel as “medium of instruction”
 - Whenever possible, show rather than tell
- Let's revisit our [syllabus](#)

Takeaways



Lesson Plan: Session 1

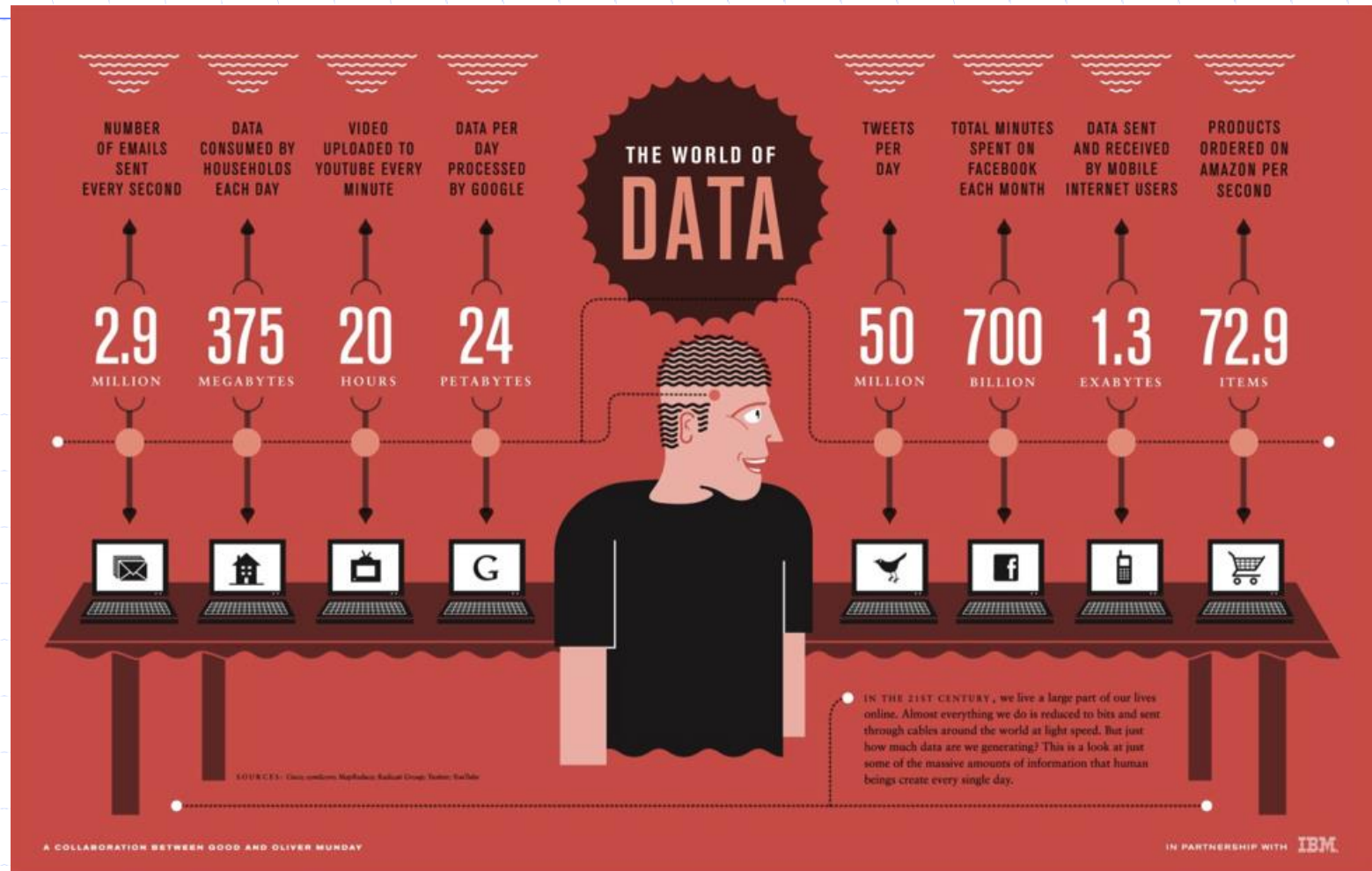
- About the course
 - Introduce ourselves
 - Cover logistical details
 - Discuss motivation, goals and structure
- Introduce decision modeling
 - Spreadsheet practices
 - Influence diagram

What's New In Decision- Making?

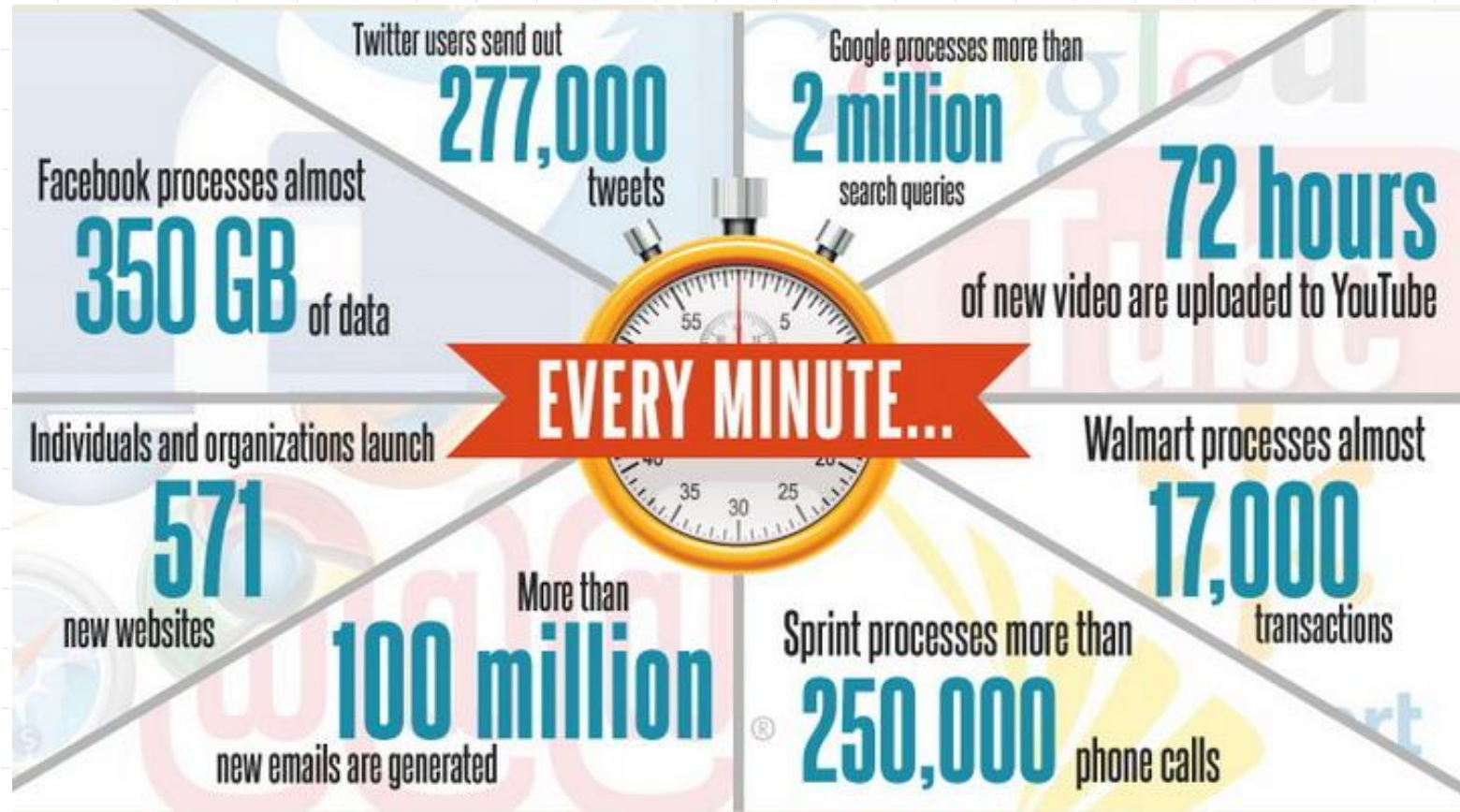
- Data!
 - 2010: Internet traffic > Σ (all previous years)
 - 2011-12: 90% of all data ever created
 - Information more than doubling every year
- Pervasive information is transforming every aspect of business operations
- "If we have data, let's look at data. If all we have are opinions, let's go with mine."

- Jim Barksdale, ex-CEO, Netscape

How Big Is Big Data?



In An Internet Minute



Leaders Harness Analytics

- Proctor & Gamble's 'Business Sphere'



Laggards Sip Through Straws

- Awash in unusable data -> no insight



Or Worse!

- Actually making bad decisions



Exercise: Health Policy

- Epidemic detected: Some Rare Horrible Disease (SRHD)
 - 1% of the population infected
- Promising new test for infection
 - 2% false negative
 - 2% false positive
- Ben, randomly tested, shows up positive
- *What is the chance Ben has SRHD?*

Probability Is Tough!

If you choose an answer to this question at random, what is the chance you will be correct?

A) 25%

B) 50%

C) 60%

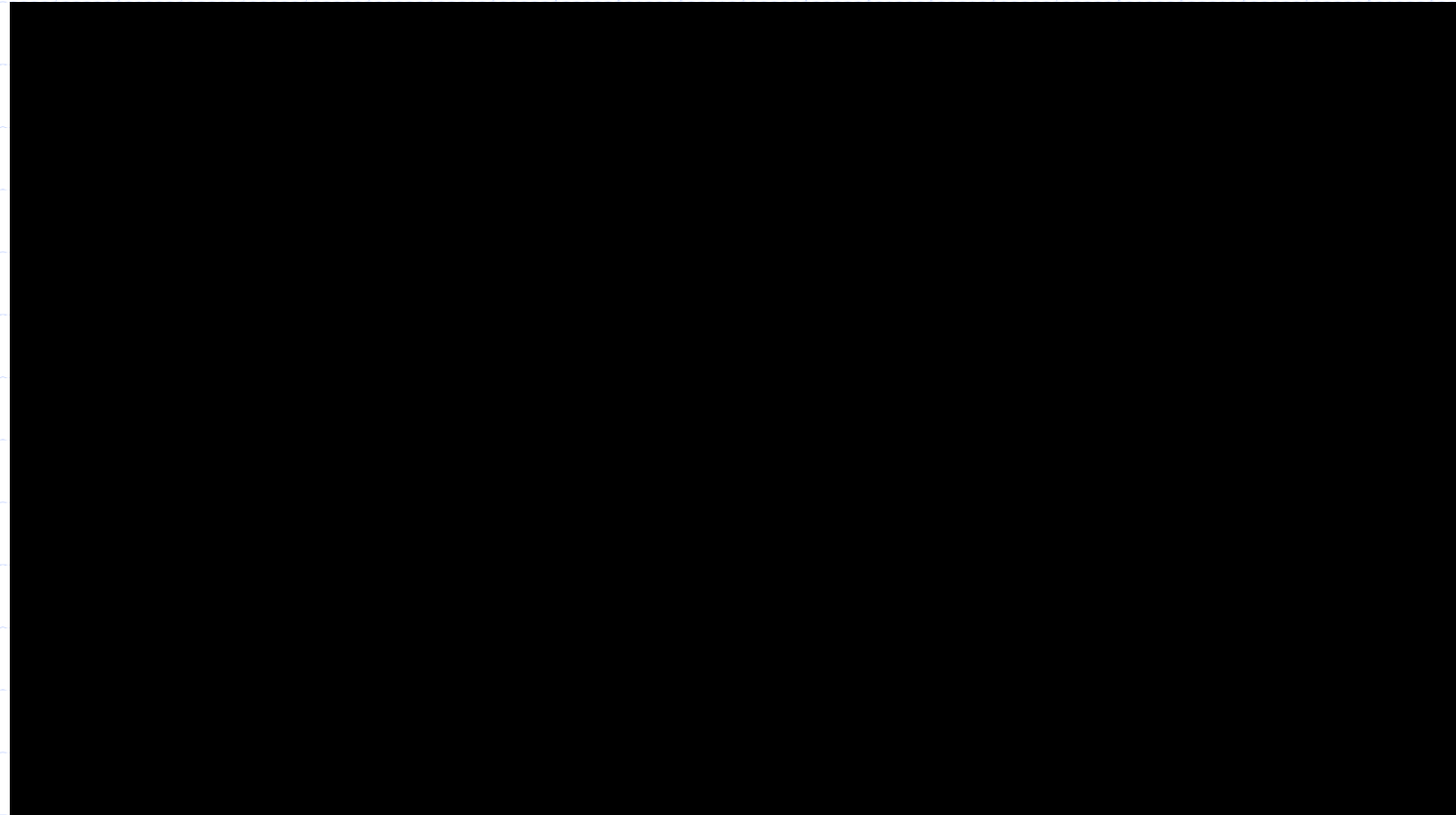
D) 25%

Analytics... Then

By this theory, we learn to appreciate precisely what a sound mind feels through a kind of intuition often without realizing it. The theory leaves nothing arbitrary in choosing opinions or in making decisions, and we can always select, with the help of this theory, the most advantageous choice on our own. It is a refreshing supplement to the ignorance and feebleness of the human mind.

If we consider the analytic methods brought out by this theory, the truth of its basic principles, the fine and delicate logic called for in solving problems, the establishments of public utility that rest on this theory, and its extension in the past and future by its application to the most important problems of natural philosophy and moral science, and if we observe that even when dealing with things that cannot be subjected to this calculus, the theory gives the surest insight that can guide us in our judgment and teaches us to keep ourselves from the illusions that often mislead us, we will then realize that there is no other science that is more worthy of our meditation.

.... And Now

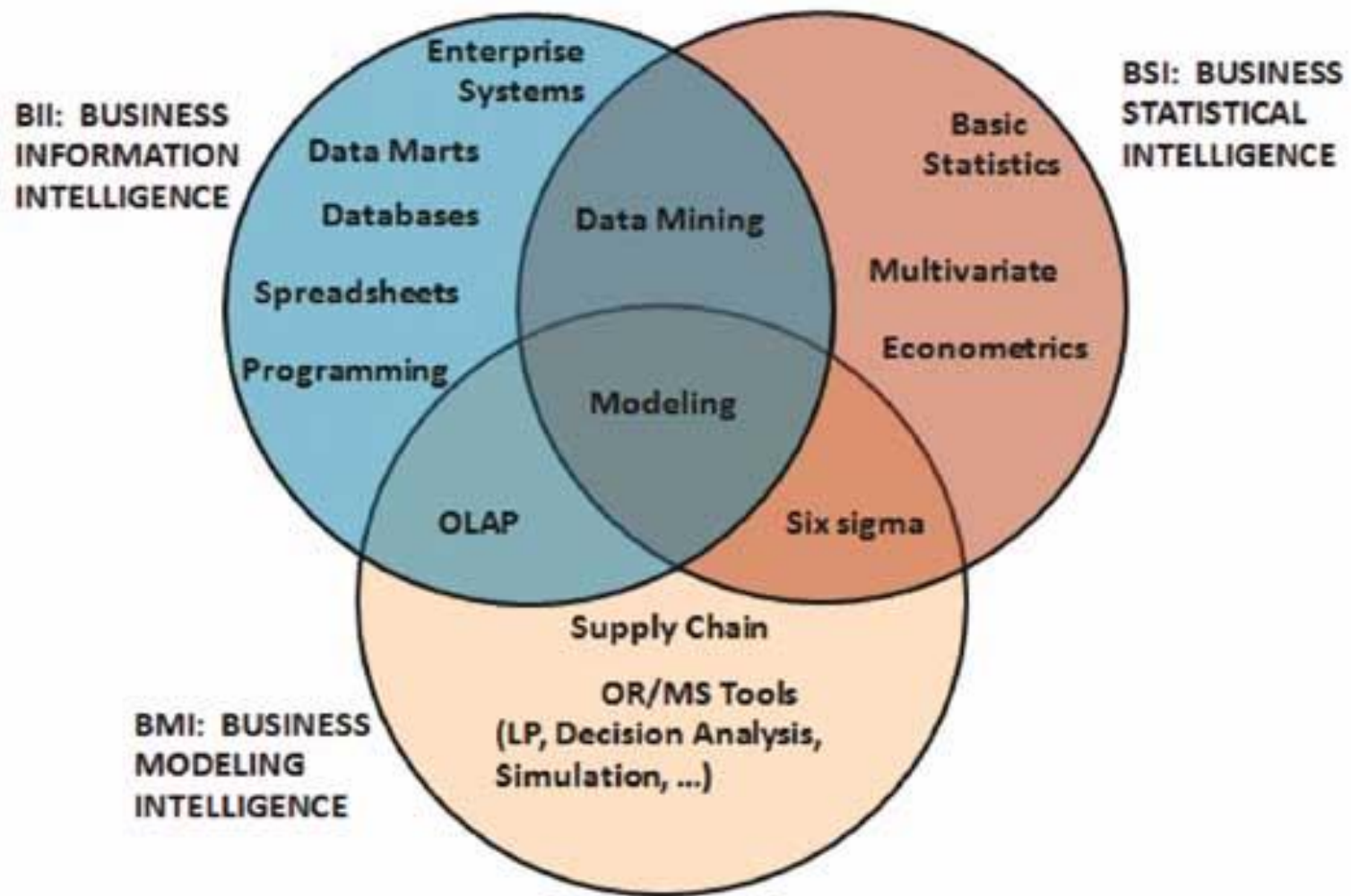


<https://www.youtube.com/watch?v=fFdITHMuY2w>

Analytics Is A Battleground!

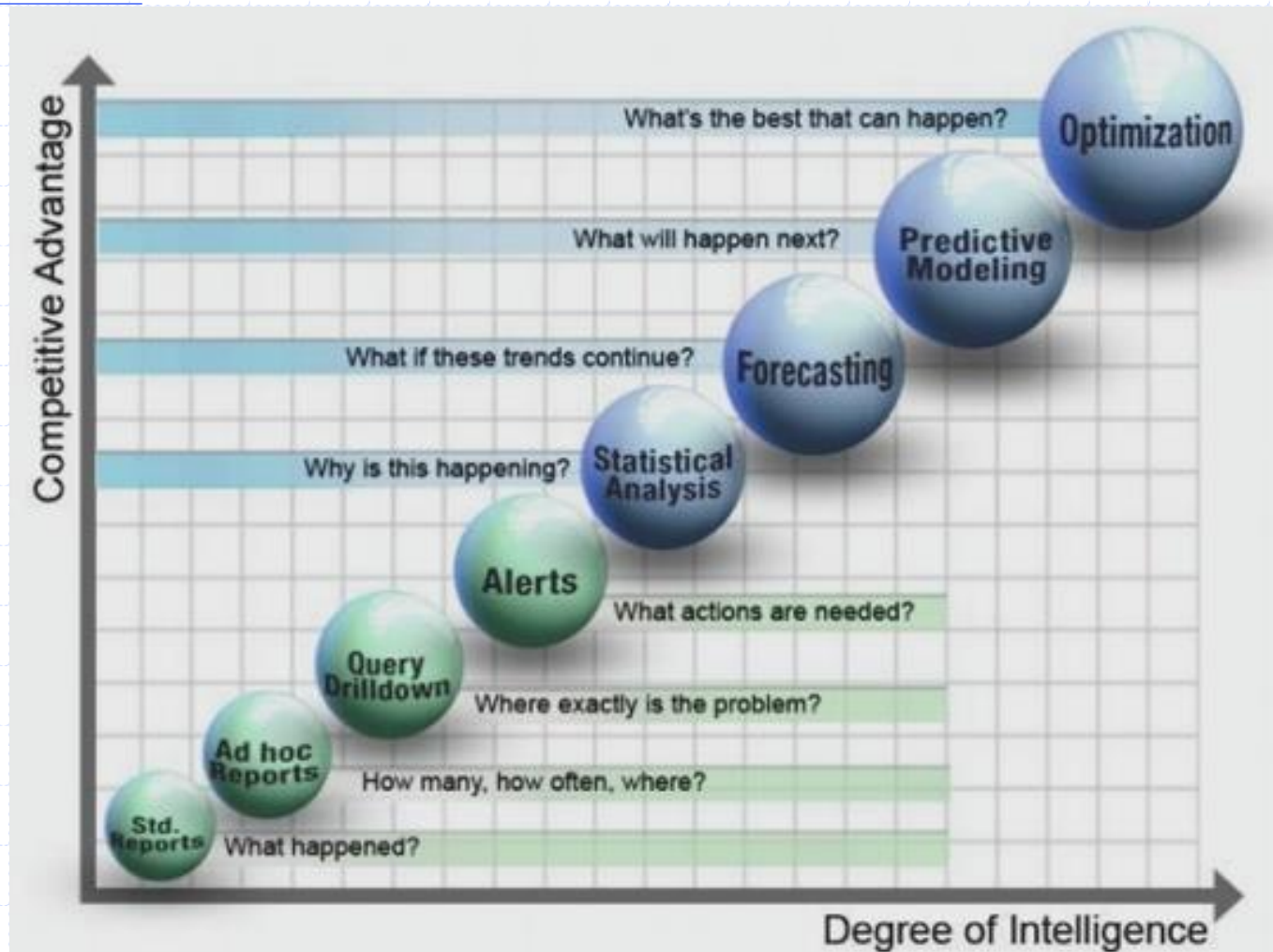
- Brands in play
 - Management Science
 - Operations Research
 - Business Analytics
 - Applied Statistics
 - Systems Engineering
 - Business Intelligence
- Allied areas
 - Machine Learning
 - Decision Analysis
- 'Analytics' seems to be winning

Technology Overview



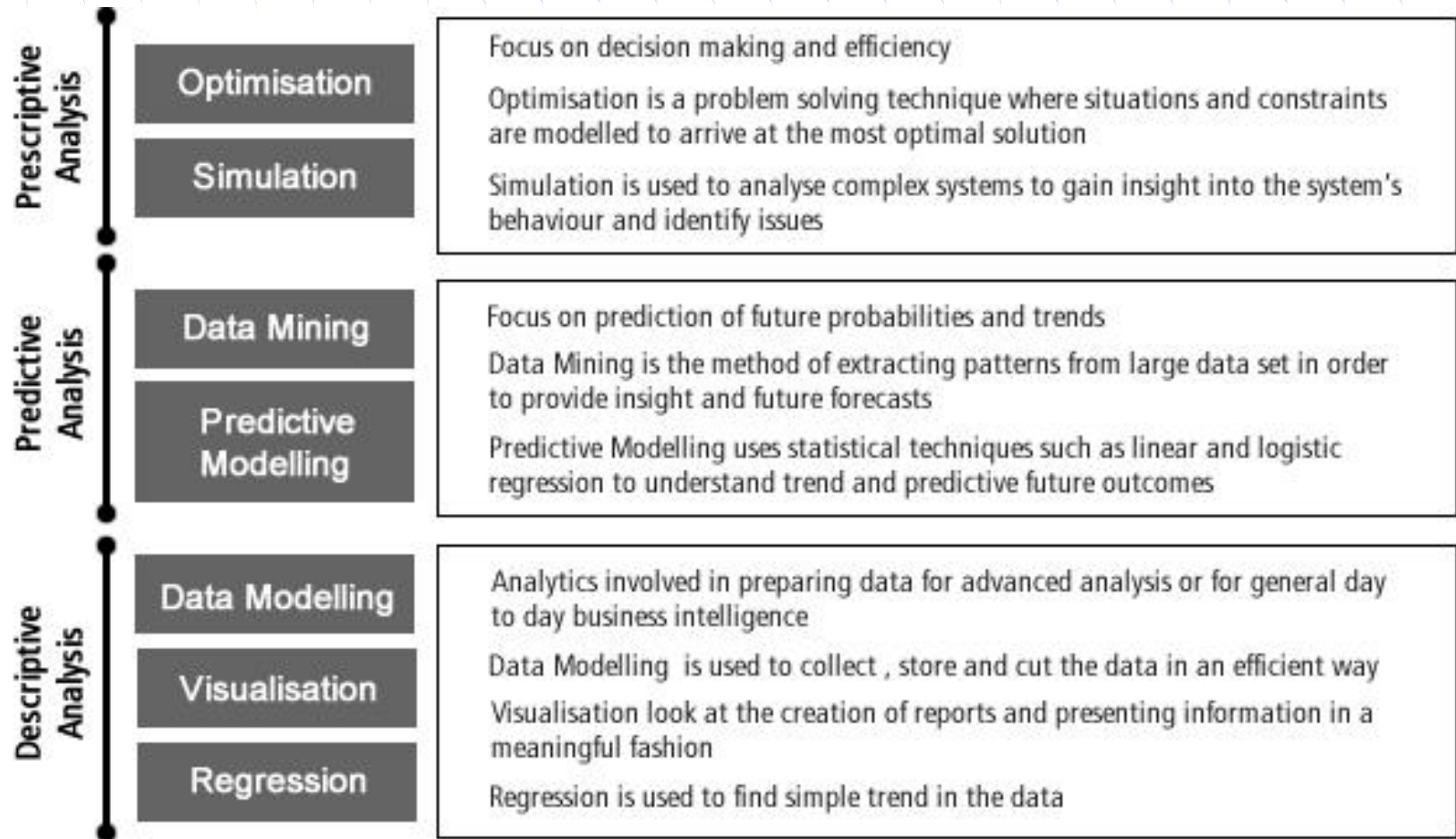
From informs.org

A More Hierarchical Overview



From SAS Institute

Analytics Flavors



206 Focuses On 'Prescriptive'



<https://www.youtube.com/v/nv2HTRWhbB4>

Formal Definition Of Analytics

- The scientific process of transforming data into insight for making better decisions.
 - Institute for Operations Research & Management Science (INFORMS)

Where Are We?

- Need for analytic decision-making
 - Simple looking problems can be subtle
- High-level view of Analytics
 - Management Science is a big part of Prescriptive Analytics

Let's Step Back To Consider

- What are decisions?
- How do we make decisions?
- What are models?
- Why should we make them?
- How should we make them?

Formal Decision-Making

- Choosing
between possible alternatives
based on preferences

But, but, but

- Do you {always, sometimes, ever} know
 - Your alternatives?
 - Your preferences?
- Can you choose meaningfully?

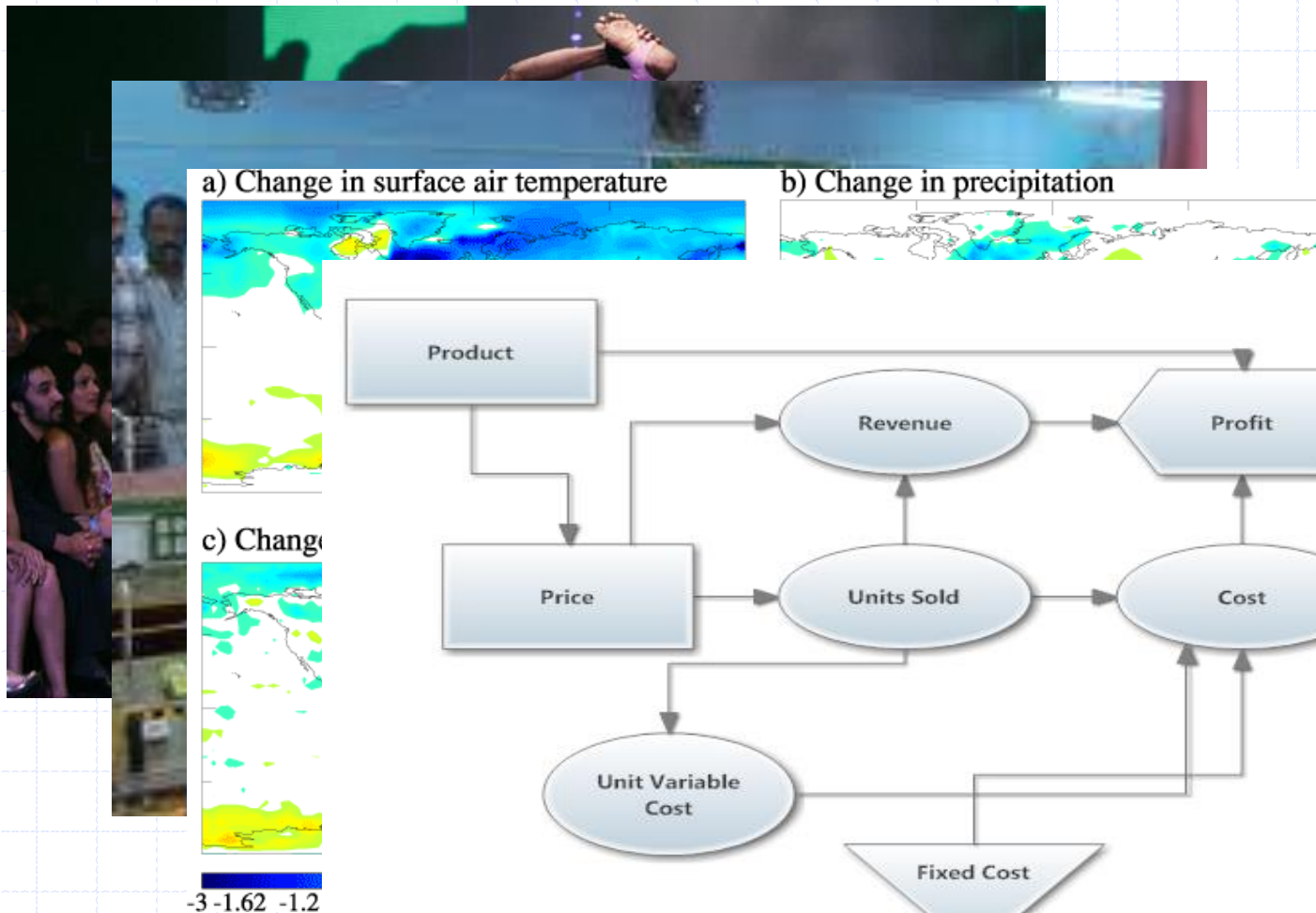
Are You A Decision-Maker?

- At home
 - At work
 - Among friends
 - In your extended family
-
- What is your decision-making approach?
 - How is your decision-making viewed?

What's A Model?

- A *simplified* version of reality
 - Irrelevant details are removed, to allow us to focus
- A *malleable yet meaningful* version of reality
 - Provides new insight into some important aspect

Types Of Models



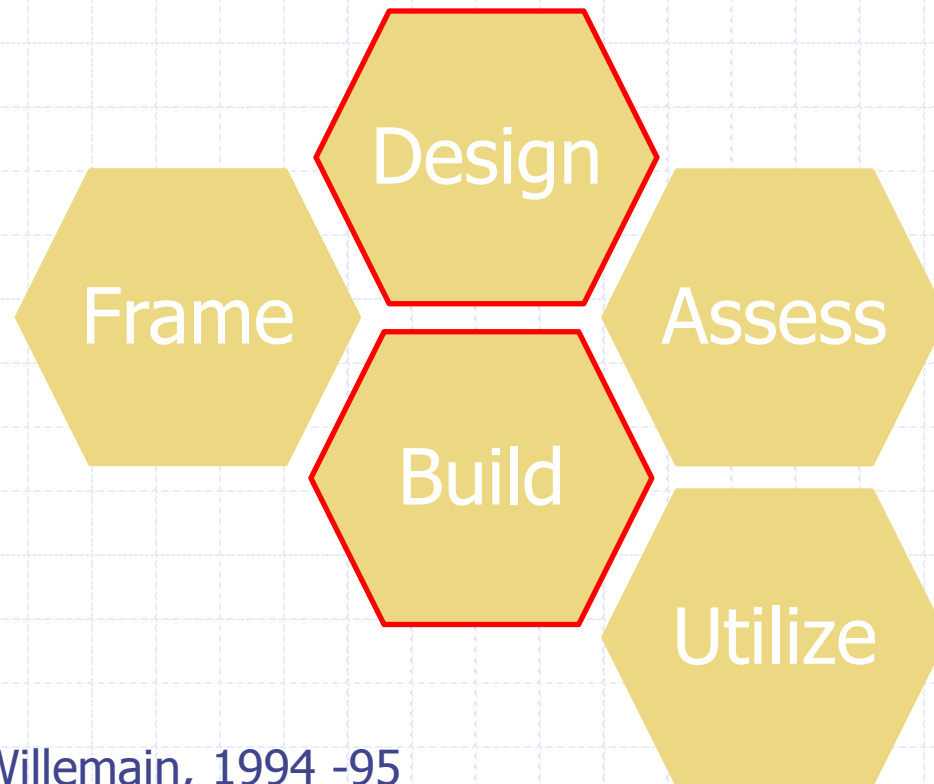
Why Build Models?

- Inexpensive experimental test-beds
- Make the impossible, possible
- Enable structured analysis
- Useful as communication devices

Using Analytics Models

- One time use models
- Decision support models
- Embedded models

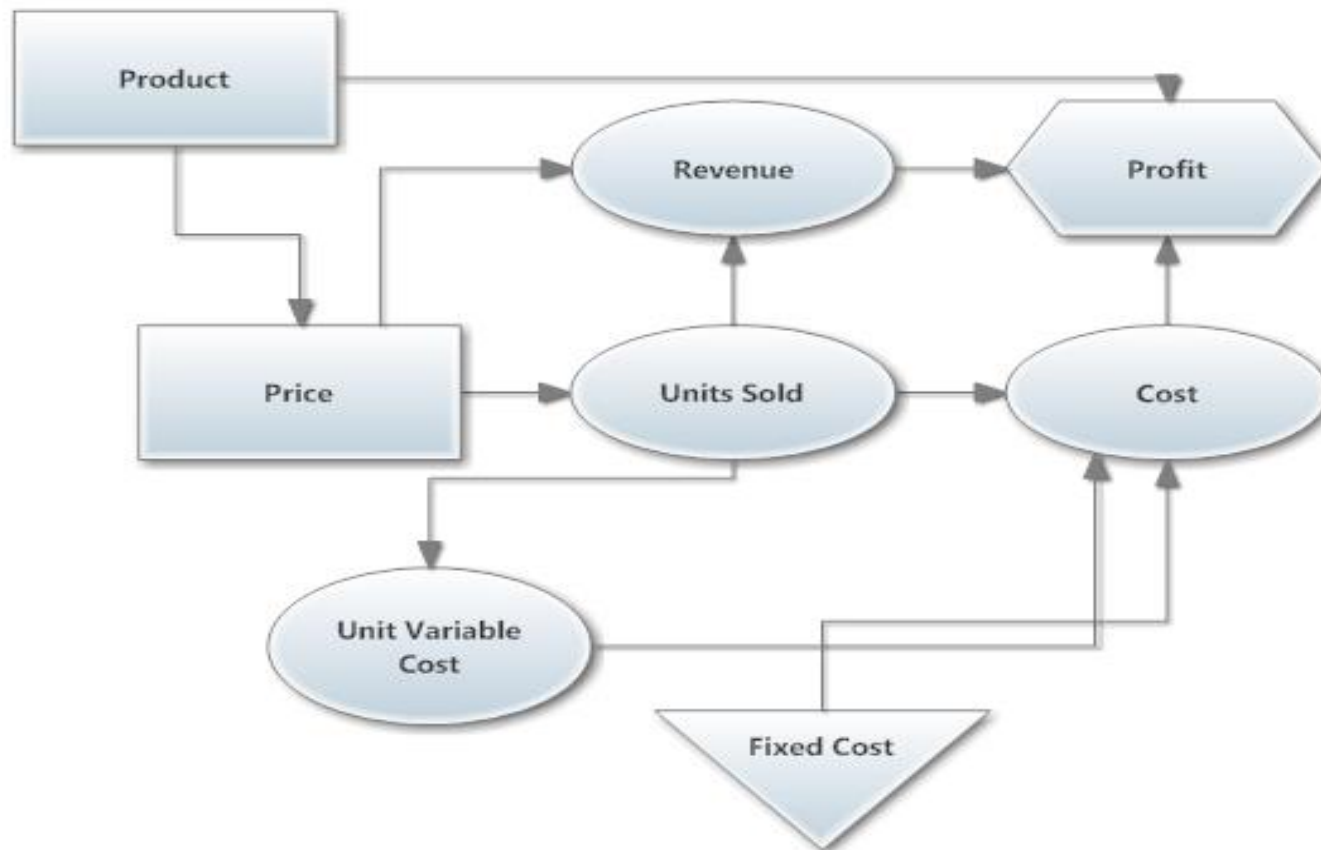
Habits Of Effective Modelers



T. R. Willemain, 1994 -95

*Insights on Modeling from a Dozen Experts and
Model Formulation: What Experts Think About and When*

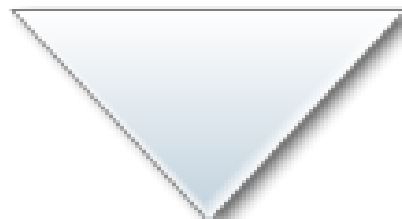
Influence Diagrams



Influence Diagrams

- Great first step in formal modeling
 - Designed to clarify understanding of critical pieces of business puzzle
 - Not designed to compute “solutions”
- Start with desired outcome
 - Identify direct determinant factors
 - Do same for each factor
 - Clearly separate data from decisions

Influence Diagram Symbols



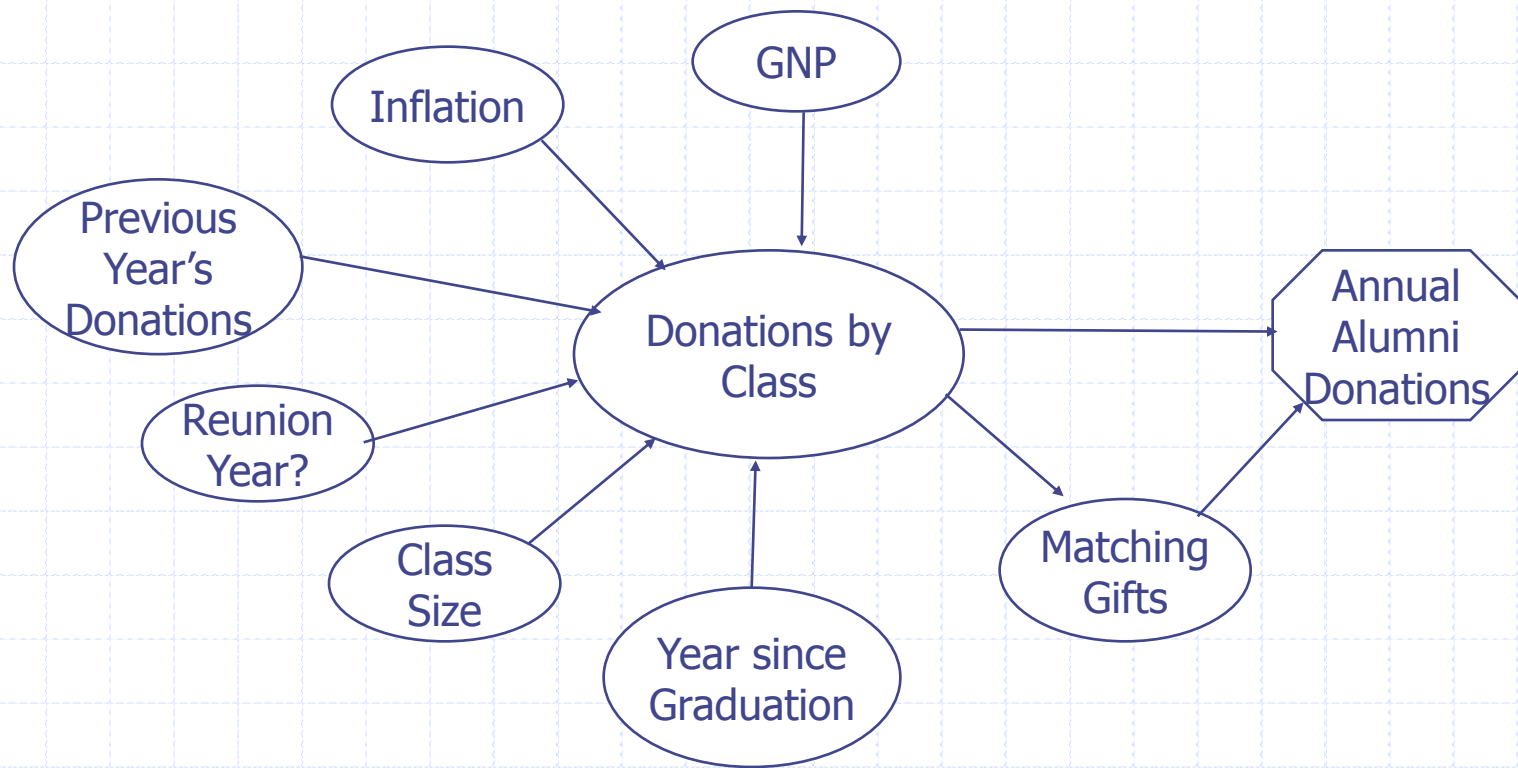
Fixed Input



Exercise: College Donations

- Draw an influence diagram as a “pre-model” for forecasting annual donations

One Solution



Using Influence Diagrams

- Goal: to clarify problem structure
 - No “correct answer”
 - Ignore numerical data
 - Record modeling assumptions as you make them
- Highly effective communication device
- Analysis will likely require going beyond



Where Are We?

- Need for analytic decision-making
 - Simple looking problems can be subtle
- High-level view of 'Analytics'
- Models and modeling
 - Influence diagrams