



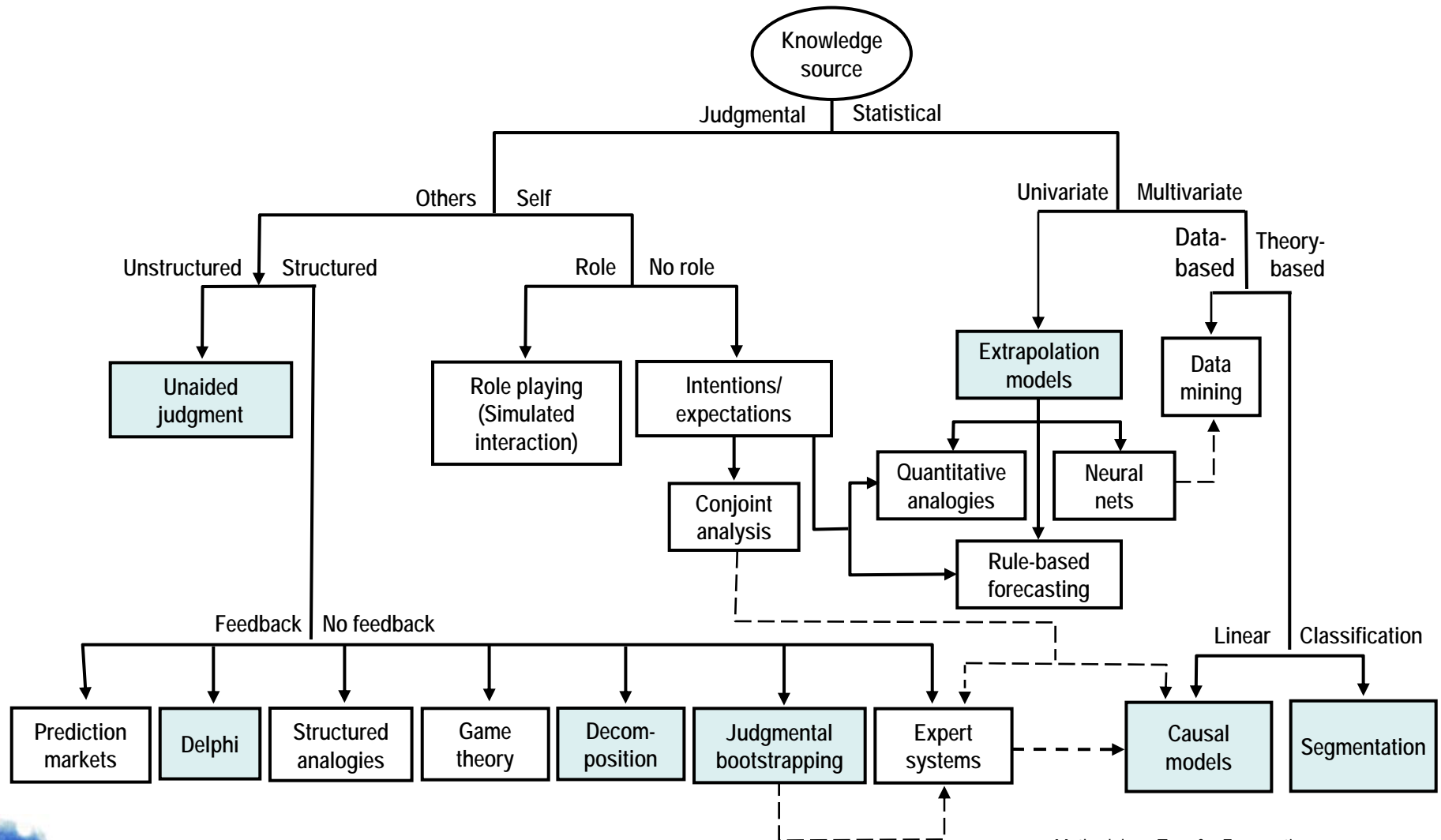
Air Travel Forecast Problem

Objectives

- Introduction to forecasting methods
- Experience with Delphi
- Experience with consensus-seeking techniques
- Strength/weaknesses of various methods



Methodology Tree for Forecasting



Air Travel Forecast Problem

Techniques for Forecasting

Form groups of about 5 to 7 people, then use the:

Delphi procedure	Minutes
First estimate – individual and anonymous	12
Statistical summary – group	3
Group discussion (use consensus technique)	20
Second estimate – individual and anonymous	2
Statistical summary - group	3
	<hr/>
	40



Group Results

Accuracy Rankings: (Round 2)	Group					Average ranks
	1	2	3	4	5	
Judgment						
Bootstrapping						
Segmentation						
Causal model						
Extrapolations						



Discussion

Discuss Delphi

Expected results

When to use

Actual Results

Initial hypotheses

Results in Air Travel study

Calculation of your error score

Conclusions



Delphi

Agreement among experts

Your results

More agreement among panelists on Round 1 _____

No differences (Round 1 vs. 2) _____

More agreement on Round 2 _____

Findings from literature: Typically more agreement on later rounds

Expected accuracy: Which do you expect to be closest to actual ranks?

Your opinions

Round 1 more accurate _____

Round 2 more accurate _____

No difference _____

Delphi improves accuracy vs. traditional meetings
given some expertise among panelists



Round 2: Previous Rankings vs. Your Rankings

Method	Average Ranking		
	MBA (21 groups)*	Adv. Mgmt. (28 groups)*	You
Judgment	2.2	2.4	
Bootstrapping	3.2	2.9	
Segmentation	2.2	2.0	
Causal	2.6	2.9	
Extrapolation	4.7	4.8	

*Groups from U.S., Sweden, Norway, and Netherlands



Evidence-based Findings

(“>” means “more accurate than”)

1. Objective methods > subjective: especially for large changes
2. Causal methods > naïve: especially for large changes
3. Bootstrapping > Judgment
4. Structured meetings > unstructured



Rankings based on Evidence-based Findings

Method	Rank	Why?
Causal model	1.5	Objective and causal
Segmentation	1.5	
Extrapolation	3	Objective and naïve
Bootstrapping	4	Objective/subjective and causal
Judgment	5	Subjective and causal

Evidence summarized in Armstrong (1985), *Long-Range Forecasting*, and Armstrong (2001), *Principles of Forecasting* – see forecastingprinciples.com



Accuracy of the Different Methods of Forecasting U.S. Air Travel, 1963-1968 (Successive updating used)

Forecast Horizon Years Ahead (Number of Forecasts)		Mean Absolute Percentage Error*		
		Extrapolation	Judgment	Econometric
1	(6)	5.7	6.8	4.2
2	(5)	12.7	15.6	6.8
3	(4)	17.4	25.1	7.3
4	(3)	22.5	34.1	9.8
5	(2)	27.5	42.1	6.2
6	(1)	29.9	45.0**	0.7
Averages		19.3	28.1	5.8

* The forecasts were lower than actual in nearly all cases.

** Estimated

Source: Armstrong & Grohman (1972) in full text at forecastingprinciples.com



Air Travel Forecast Problem

Average Error Scores*

	Round 2
MBAAs	7.4
Advanced Mgt.	7.5
Forecasting Experts	8.4
You	<input type="text"/>

***Key:** Best possible = 0
No information (all ties) = 6
Worst possible = 12



General Advice

- Beware of unaided judgment
- Be conservative when uncertain – thus, use equal ranks given uncertainty about most accurate method

