My Research

KMIS Doctoral Consortium 2006

Bock, Gee-Woo

Agenda

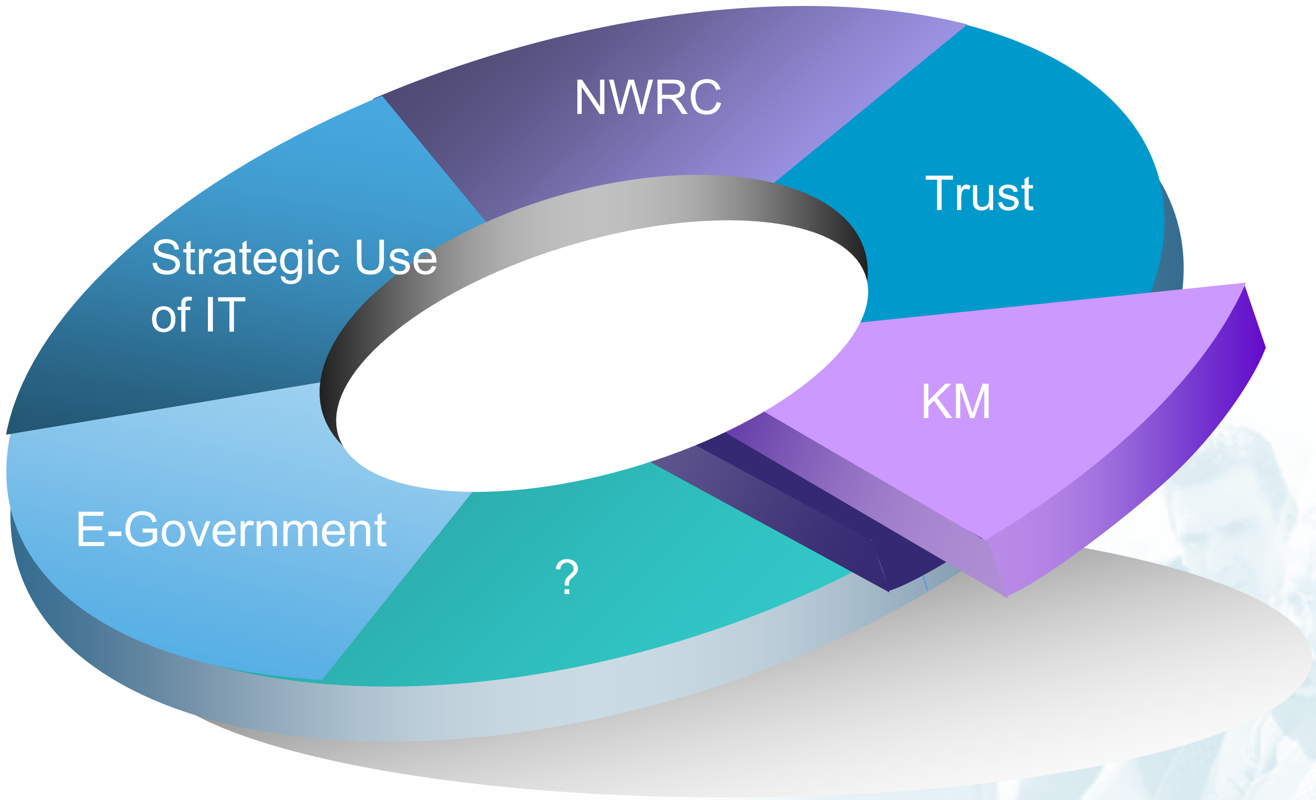
1. Research Interests

2. How to execute

3. How to publish

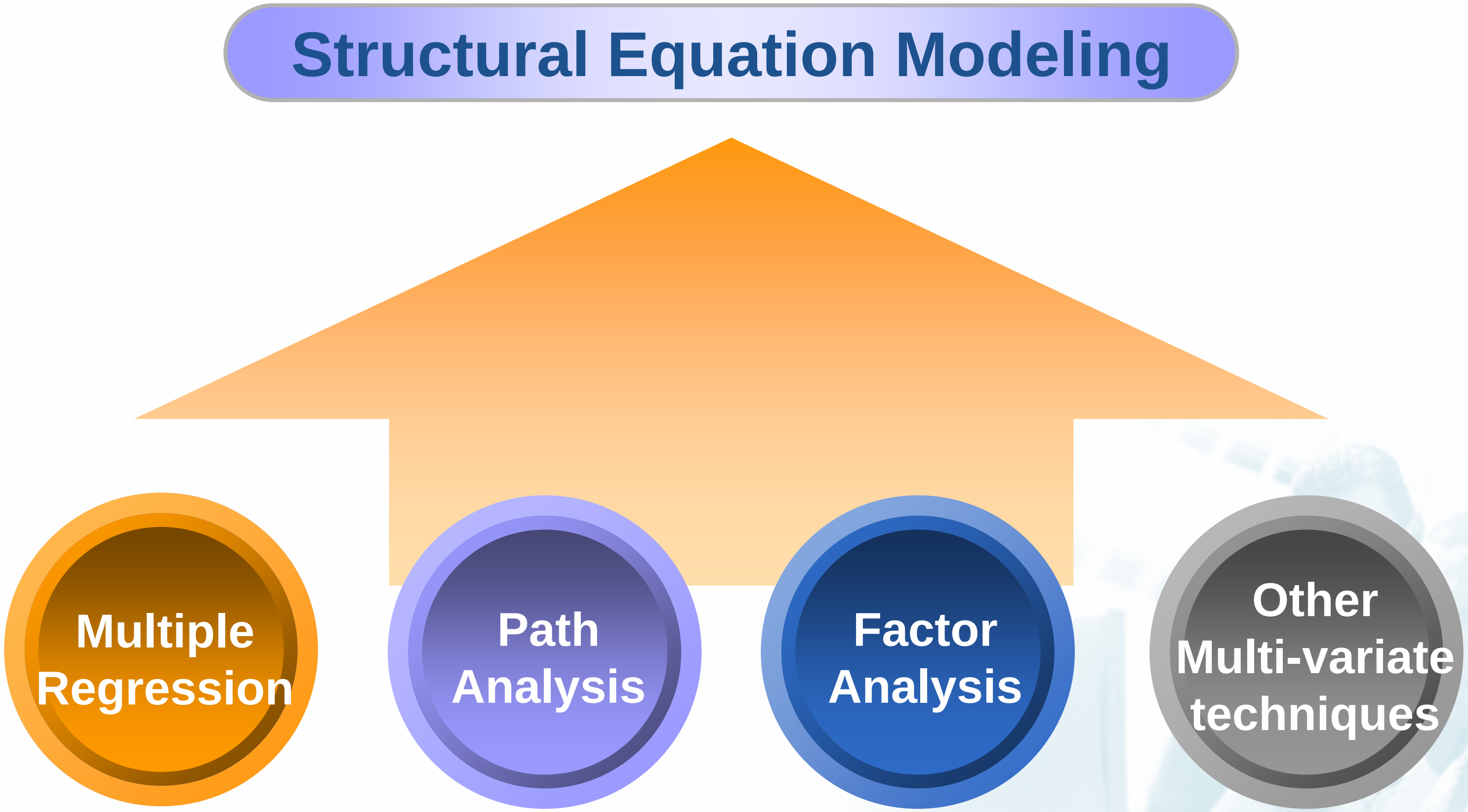
4. Q&A

Research Interests

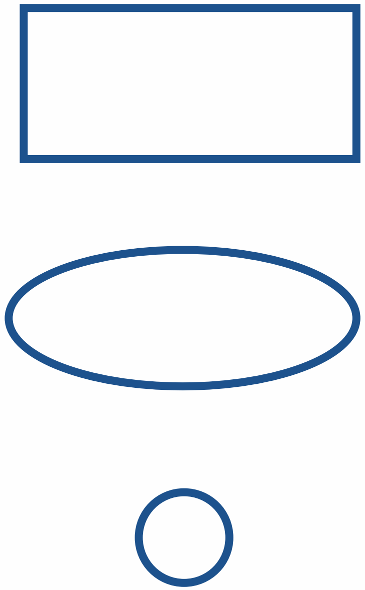


Research Issues in Knowledge Management

How to execute

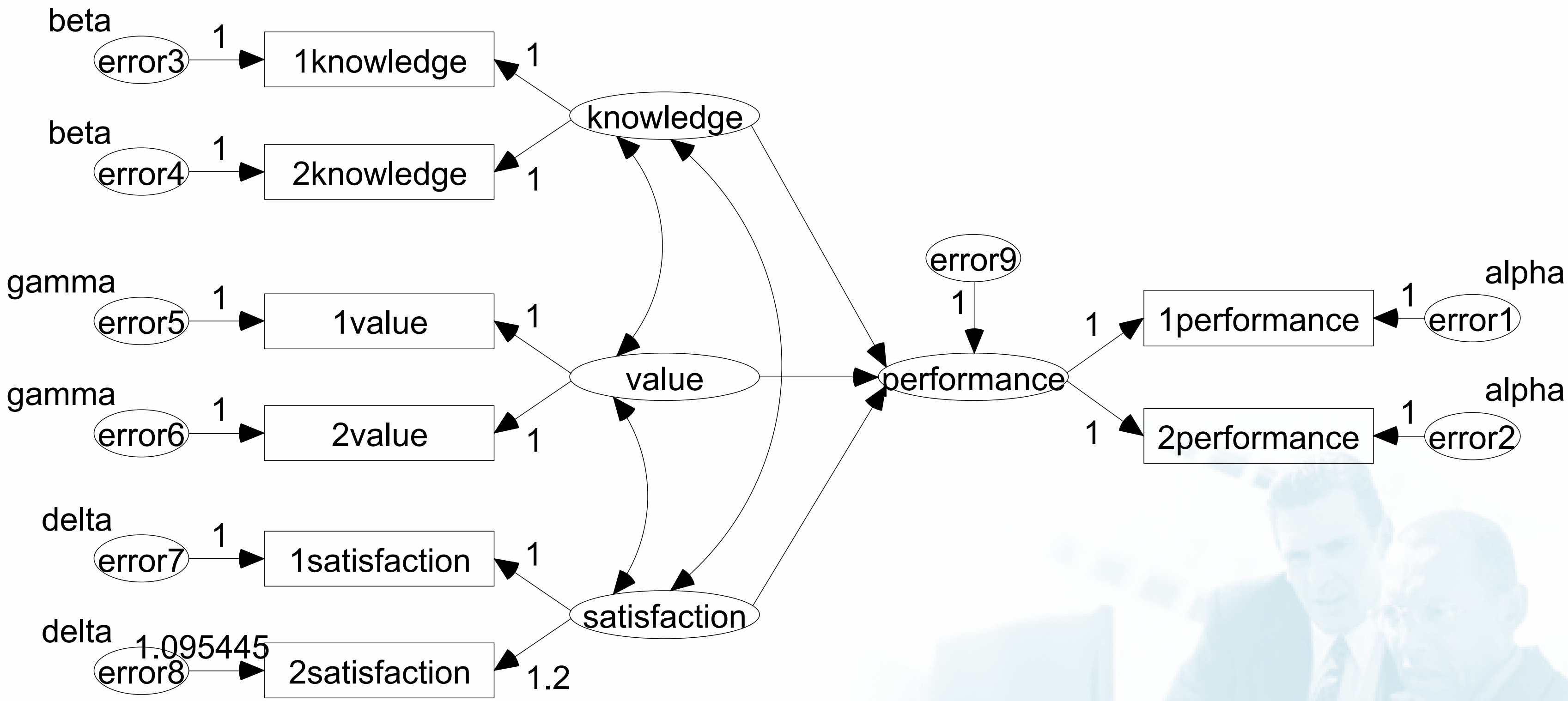


Symbols Used in SEM



- Observed Variables
- Latent (unobserved) Variables
- Measurement Error (observed) or Residual Terms (Latent)

MR, PA & FA within SEM



Example 5: Model B
Parallel tests regression
Job performance of farm managers
Warren, White and Fuller (1974)
Model Specification

SEM is…

- Fantastic for theory-testing
- Able to overcome ‘problems’ with conventional analytical techniques, such as:
  - MR does not allow exploration of relationships between dependent variables
  - MR, path analysis use single indicator variables as proxies for complex constructs
  - When using composite variables, it is assumed that all indicators are measured with equal error and all contribute equally

Continued…

- Analysis of covariance structure
- Latent variable analysis
- Causal modeling
- LISREL
  - PLS, AMOS

Cautionary note!

- SEM does not prove causality between variables!
  - SEM, like other relational techniques, is based on dependence relationships (change in one variable results in change in another). However, causation is dependent on theory and study design, not analytical technique.
- For causation, four conditions need to be met
  - Sufficient association between variables
  - Temporal antecedence of the cause vs. effect
  - Lack of alternative causal variable
  - Theoretical bases

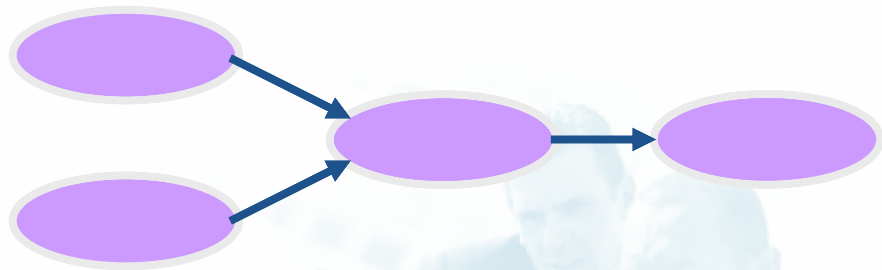
How does SEM work?

- In a nutshell, if S=Σ, then the model fits the data!
  - S = Empirical/observed/sample variance/covariance matrix
  - Σ = Model implied variance/covariance matrix

S – from Data

x1	x2	y
1	2	3
3	4	4
4	5	2
3	1	5

Σ – from Model



Are these matrices 'statistically' equal?

Var(x1)		
Cov(x1,x2)	Var(x2)	
Cov(x1,y)	Cov(x2,y)	Var(y)

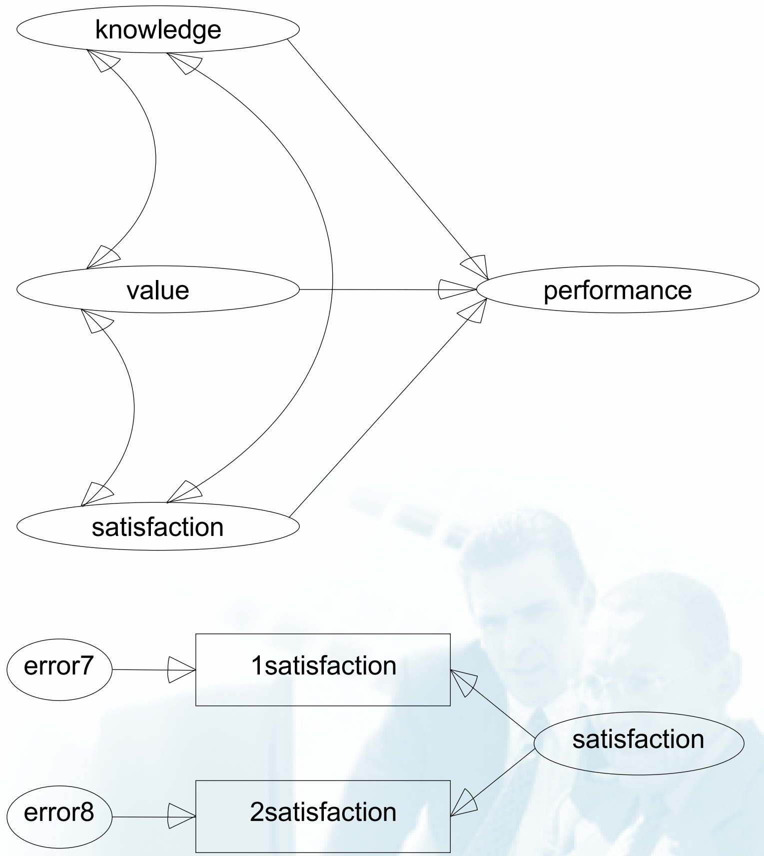
0		
a+bx		
0	by+c	0

SEM Analysis Process

- Stage 1: Specify model
- Stage 2: Determine whether the model is identified
- Stage 3: Select measures of variables in the model and collect data
- Stage 4: Analyze model
- Stage 5: Evaluate model-data fit
- Stage 6: If necessary, re-specify model and re-evaluate revised model

Stage 1: Specify model

- Theory based structural model
- How will constructs be measured? Measurement models
- Full specification: Measurement + Structural Models
  - Single-step approach
  - Two-step approach
    - Theory is not well established
    - Measurement instrument is untested



Stage 2: Determine whether model is identified

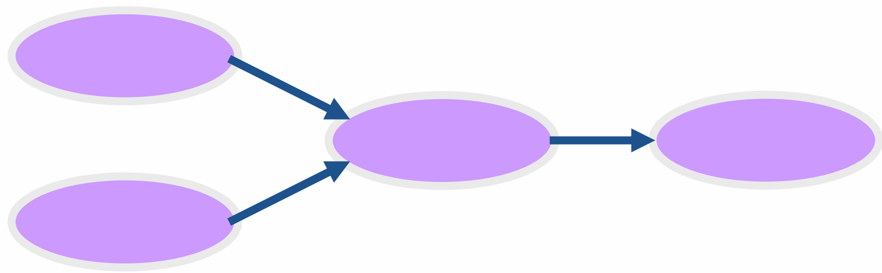
S – from Data

x1	x2	y
1	2	3
3	4	4
4	5	2
3	1	5

Total # of observations: v(v+1)/2

Var(x_1)		
Cov(x_1,x_2)	Var(x_2)	
Cov(x_1,y)	Cov(x_2,y)	Var(y)

Σ – from Model



Total # of parameters: t

0		
a+bx		
0	by+c	0

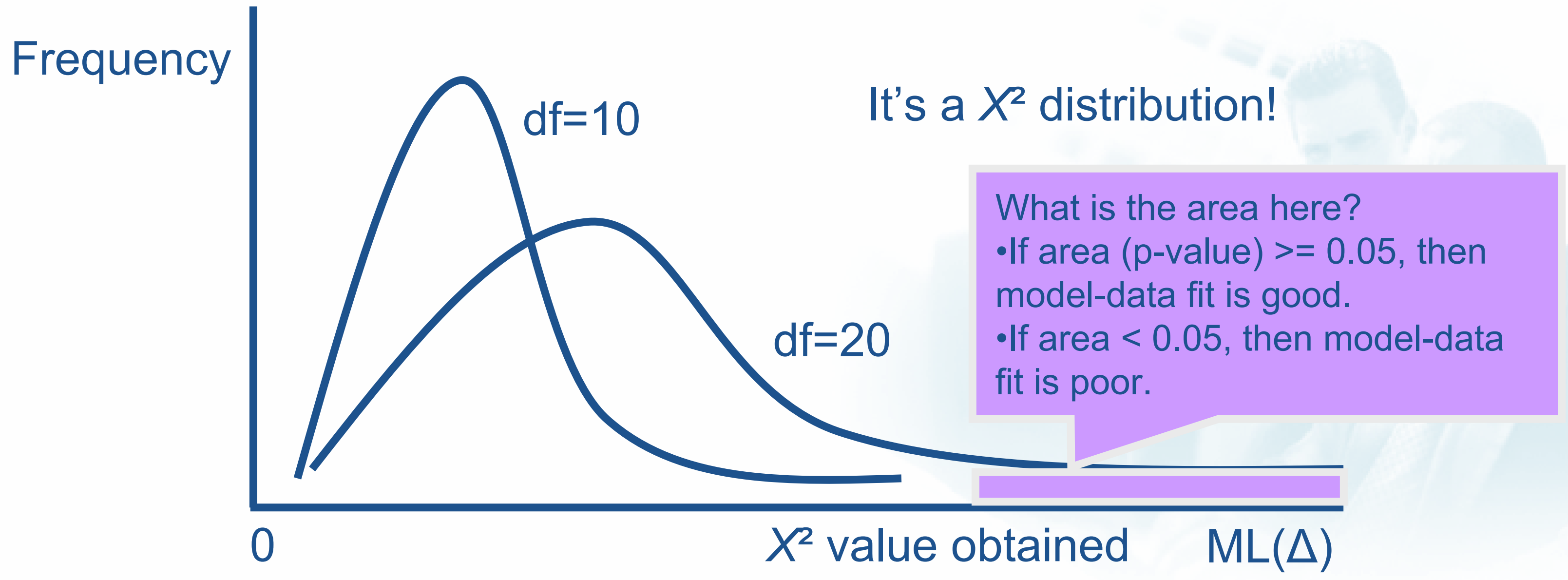
- If v(v+1)/2 < t, too many variables and not enough equations. SEM cannot proceed: Model is under-identified.
- If v(v+1)/2 = t, then unique values for free parameters. SEM is unnecessary: Model is just-identified.
- If v(v+1)/2 > t, multiple values for each free parameters. SEM ideally suited: Model is over-identified.
- N.B. degree of freedom (df) = [v(v+1)/2] - t

Stage 4: Analyze model

- Parameter calculations
  - If more than 1 solution for free parameters, then use systematic procedure to select appropriate value.
  - Method available
    - Simple average
    - Maximum likelihood
    - Generalized least squares etc.
  - E.g. Var(x) = {1, 5, 6}
    - Average = 4
    - ML = 4.1?
    - GLS = 3.8?
- Calculate difference between observed and model-implied matrices
  - $S - \Sigma = \Delta$ (‘Discrepancy’ function)
- Iteratively minimize Δ
  - If $\Delta = 0$, then model-data fit is good. Go to Stage 5.
  - If $\Delta > 0$, then model-data fit is poor. Iteratively update values in model-implied matrix, until Δ is minimized.

Stage 5: Evaluate model-data fit

- Δ, in matrix form, is not very 'user-friendly'
- Convert Δ to 'usable' statistic using same parameter estimation technique, e.g.
  - Simple average $\Delta = Av\,(a_{ij})$
  - Maximum likelihood $\Delta = \log|\Sigma| + tr(S\Sigma^{-1}) - \log|S| - (p+q)$
- Draw frequency distribution



Continued…

- Problems with X^2-based measures:
  - Sensitive to large sample sizes (i.e., always say poor fit if n > 200)
  - No upper bound – so not easy to interpret in a standard way
- To overcome these problems, many other fit statistics have been proposed.
  - Absolute Fit Indices
  - Incremental Fit Indices
  - Model Parsimony

Stage 6: If necessary, Re-specify model & Re-evaluate revised model

- When model-data fit is poor, re-specify model and re-evaluate model (i.e. return to step 1)
- Look for ideas for model improvement by reviewing modification indices and residuals
- Caution: This step is controversial – some regard it as post-hoc revisionism!

Additional Points to Note

- Data type:
  - Best if all measures are interval scale
  - If ordinal scale (Likert), SEM results are conservative (i.e., some effects will not be detected)
- Model complexity
  - Keep it simple!
  - Sample size restrictions – 10 cases/parameter
- SEM is excellent for testing mediating effects
- SEM is not so good for moderating effects
  - How to standardize (normalize)
    - Multiply the 2 constructs together using excel.
    - Then open the file in SPSS.
    - Analyze - descriptive statistics - descriptives.
    - Select the multiplied items and save standardized values as variables.
    - The standardized values will appear.
    - Then use these values as the moderating variable in SEM.

Conclusions

- SEM is a very ‘powerful’ method for testing models (but requires a lot of care and attention detail!)
  - It depends on ‘good’ theory!
  - It depends on ‘good’ data!
- There may be other more appropriate methods (such as MR) for testing models.

How to publish in top journals

Time Management

•Concurrent projects, but prioritize
•Collaborative activities
•Work as hard as collaborators

Topic Selection

•Reviewers ask: What is the contribution? – Practice & Lit
•Nature of Con: New Theory; Empirical; Methodological
•Focus on Phenomena, not Tech

Before Submission

•Choose a right journal
•Help reviewers
•Consider stakeholder perspective

•Let your manuscript "ripen"
•When you think you are finished
-Let the ms "sit"
-Read it from start to finish
-Most often, you discover that it's not finished…

Revision Process

•What delays review?
•Most papers are rejected
•Reviewers try to help authors
•Respond all reviewers' comments
•Rejected manuscripts

Crafting Your Manuscript

Introduction	Theory	Methods	Discussion
Describe Convince Provide a “roadmap”	Articulate Bridge Provide a conceptual framework Keep consistency Present prior literature… Precede hypotheses…	Need to know what you have done Wish to apply yours Justify Describe Hide	Describe analyses & findings Point out Interpret Use conceptual model; anecdotes; figures, tables; Don’t overstate

Conclusion:

What you should not do…summarize the article, introduce anything for the first time, discuss weaknesses

What you should do…focus on key messages, market the contributions, maintain a positive tone