MAP ACADEMY

Methodology, Analytics & Psychometrics

Designing Better Questionnaires and Measures

Initial considerations and construct operationalization

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Nebraska Academy for Methodology, Analytics and Psychometrics

- Wide range of support services for funded research projects
- Expertise in
  - Statistics & Modeling
  - Applied Psychometrics
  - Program Evaluation
  - Mixed Methods
  - Prevention Science

Three Part Series

Designing Better Questionnaires and Measures

1. Initial considerations and construct operationalization (Today)
2. Constructing and Testing the Instrument (February 6)
3. Psychometric Review (April 3)

Why is this topic important?

- Poor measures can lead to wrong decisions
- Poor measures impose an absolute limit on the validity of the conclusions one can reach
- If you cannot determine what the data mean, the amount of information collected is irrelevant

DeVellis, 2011

Focus of the Series

- Development of non-cognitive measures*, surveys, and questionnaires in educational, psychological, and social science research

  *no correct or incorrect response (e.g. attitudes, opinions, perceptions)

- Many of the concepts generalize to other applications
  - Cognitive tests (ACT/SAT/GRE)
  - Behavioral observation measures

Session Overview

- Review definitions related to measurement
- Process of developing a measure - overview
- Defining a construct
  - Research questions
  - Literature review
  - Qualitative research
- Tips for identifying existing measures
- Considerations for mode of delivery
- Preparing for the next presentation

SOME DEFINITIONS…

What is measurement?

- A way of making sense of our observations or people, objects and events through quantification (DeVellis, 2011)
- “The assignment of numerals in such a way as to correspond to different degrees of a quality . . . or property of some object or event” (Duncan, 1984, p. 126)

What is a construct?

- The underlying phenomenon that a measure is intended to reflect
- The cause of the item score
  - The strength or quantity of the construct (i.e., the value of its true score) is presumed to cause an item (or set of items) to take on a certain value
- Also referred to as a latent variable or trait

DeVellis, 2011

What is a measure?

- A collection of items combined into a composite score of a single phenomenon
  - Items serve as “effect indicators” of an underlying construct or latent variable (Bollen, 1989)
- Intended to reveal levels of theoretical variables not readily observable by direct means and therefore proxies for variables that we cannot directly observe
- By assessing the relationships between measures, we indirectly infer the relationships between constructs

DeVellis, 2011

Classical Test Theory Measurement Assumptions

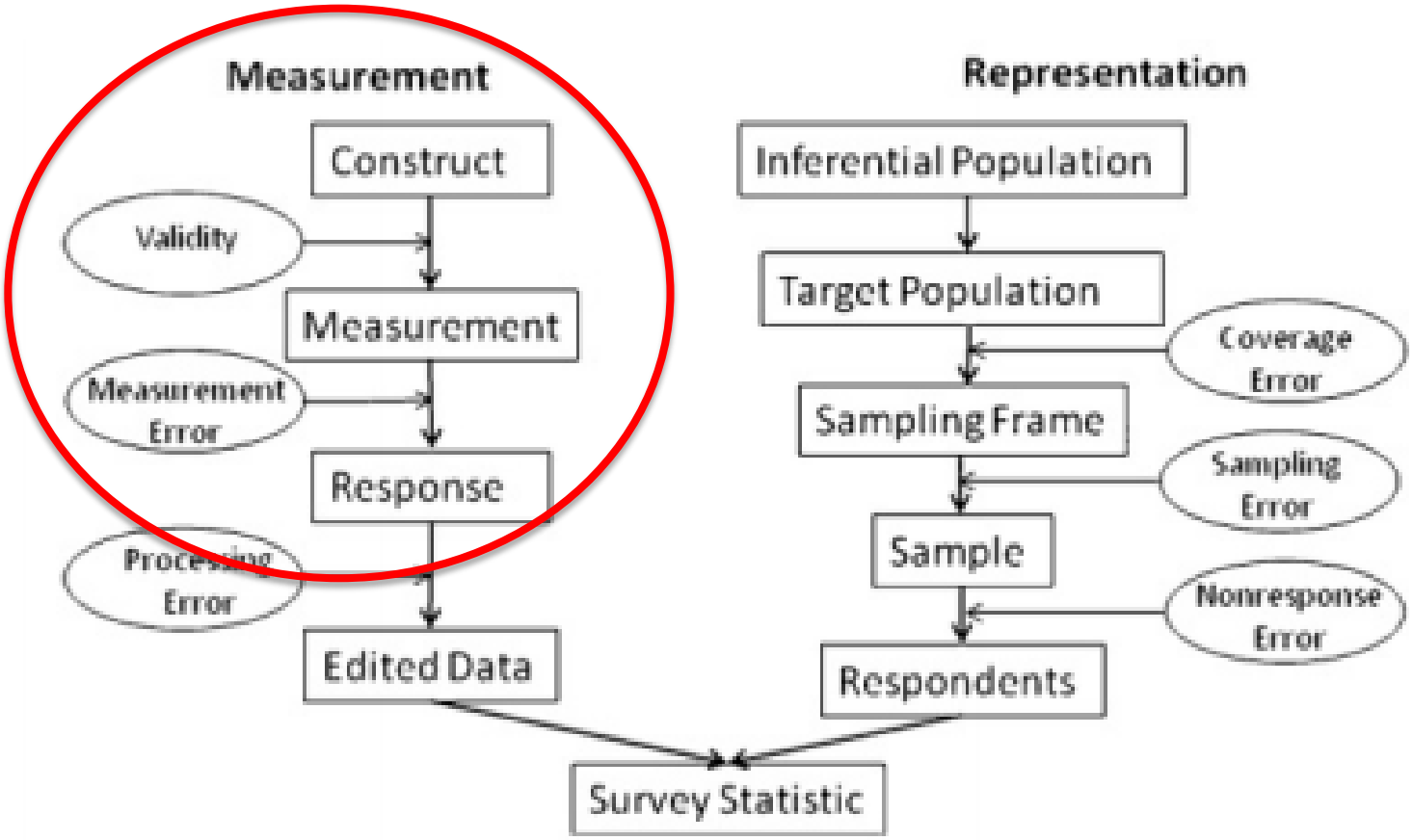
$$x = T + e$$

(observed score = true score + error)

1. The amount of error associated with individual items varies randomly
2. One item's error term is not correlated with another item's error term
3. Error terms are not correlated with the true score of the latent variable

DeVellis, 2011

Total Survey Error



Groves, 2009, figure 2.4

Hallmarks of quality measures

- Reliable scores are consistent (i.e. repeatable)
- Valid scores accurately measure what they purport to measure

Thorndike, 2010

MEASURE DEVELOPMENT PROCESS

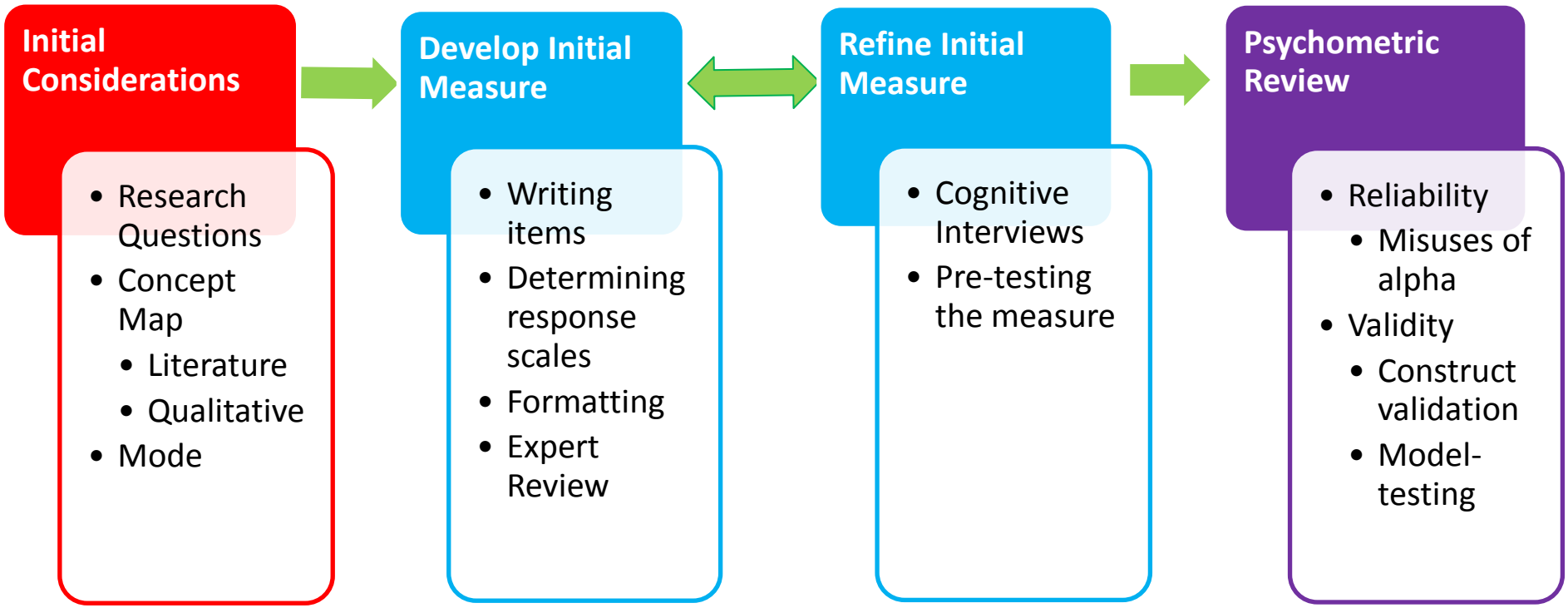
Begin with the end in mind…

The final 5 minutes of the film “The Sixth Sense” was shown to workshop participants. In order to be sensitive to copyright issues, we are not including that clip here.

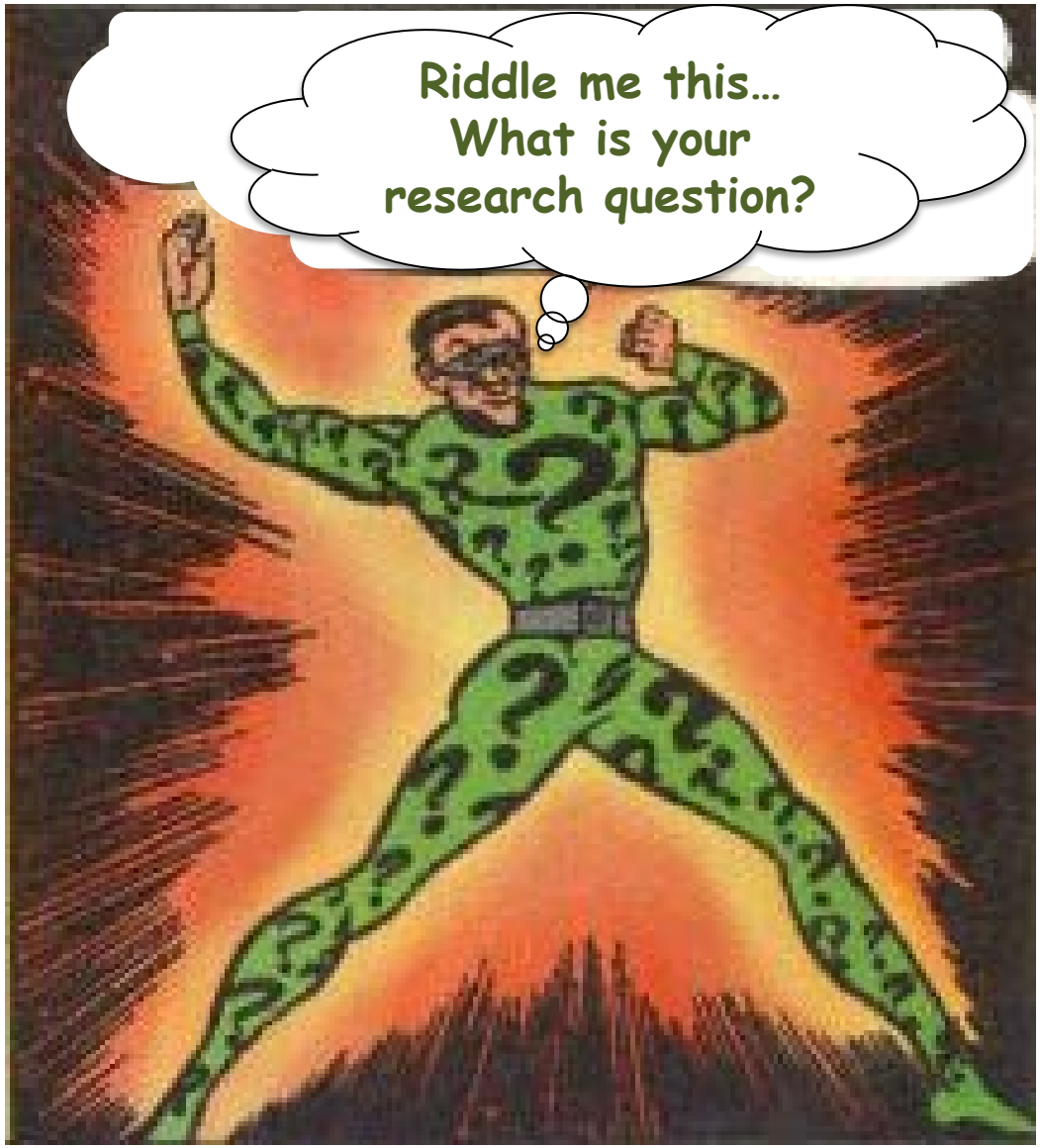
What does your ending look like?

- What do you want to be able to say in your results chapter?
- Write it out as if you have already collected and analyzed your data.
  - Use XX.xx for values, so you don't get confused when you have real data and results

Measure Development Process



CONCEPT MAPPING



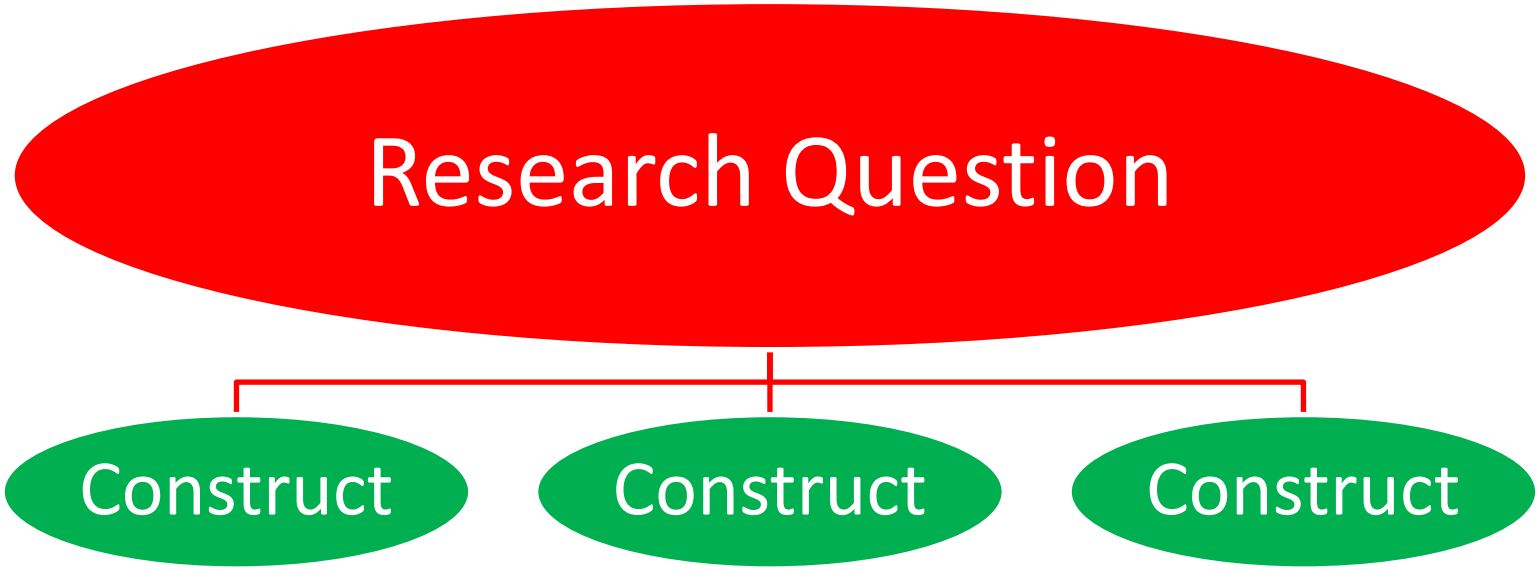
Quantitative Research Questions

- Narrow and specific
- In response to a problem that calls for explanation
  - The trends in a large group (descriptive)
  - The extent that groups differ (comparative)
  - The effect of a treatment (relationship)
- The focus is a small set of specific factors (variables)
- Variables are examined in a certain planned way

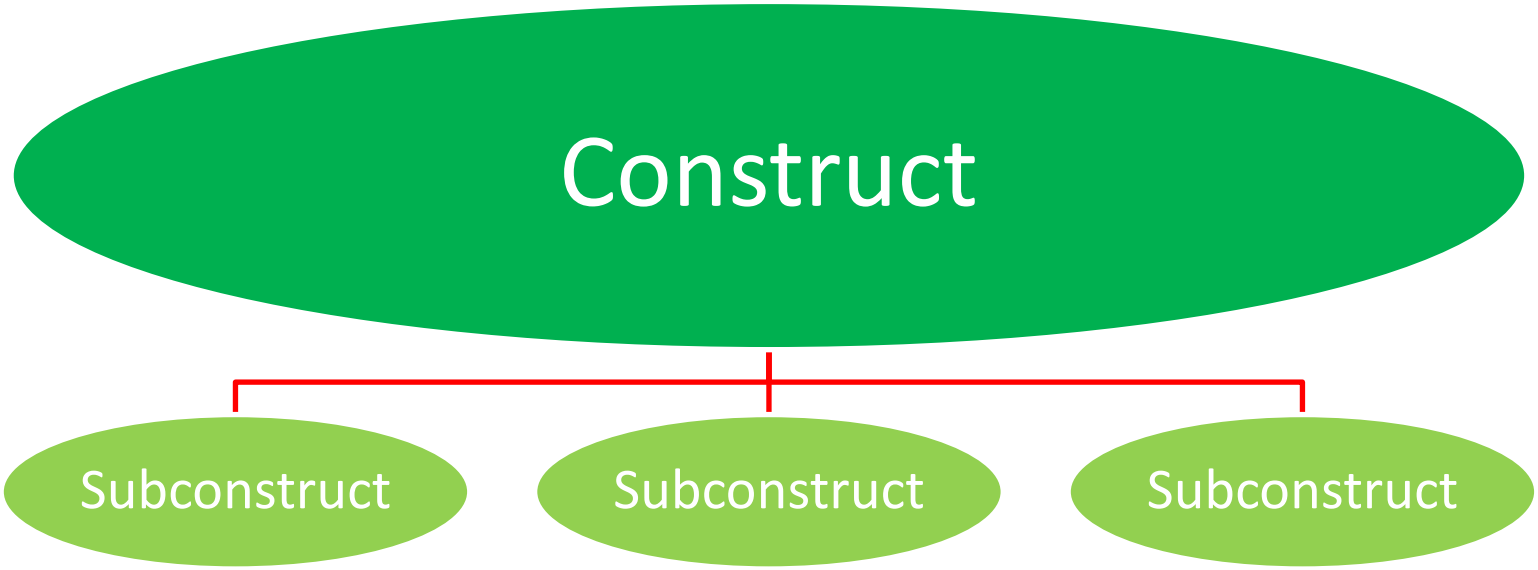
Plano Clark & Creswell, 2014

WHAT ARE SOME OF YOUR RESEARCH QUESTIONS?

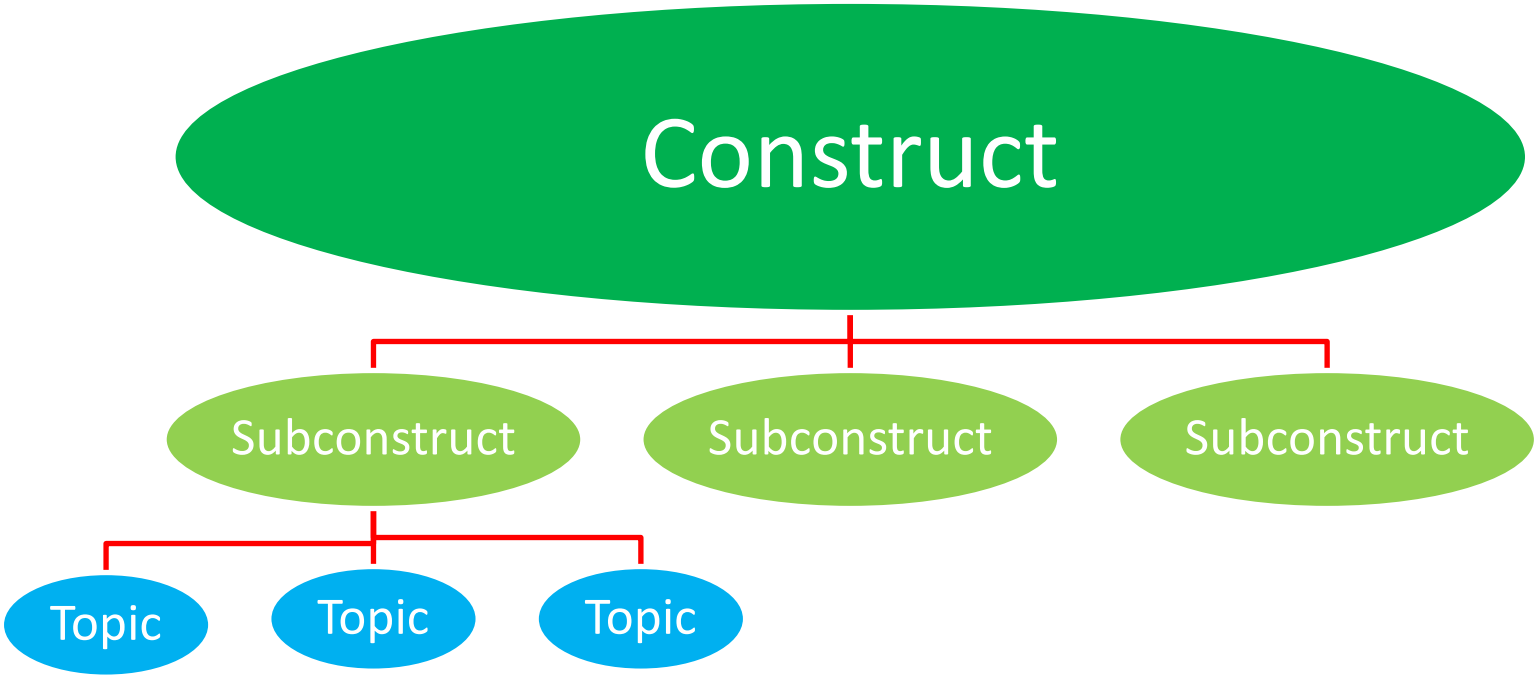
Research Questions may include multiple variables (or constructs)



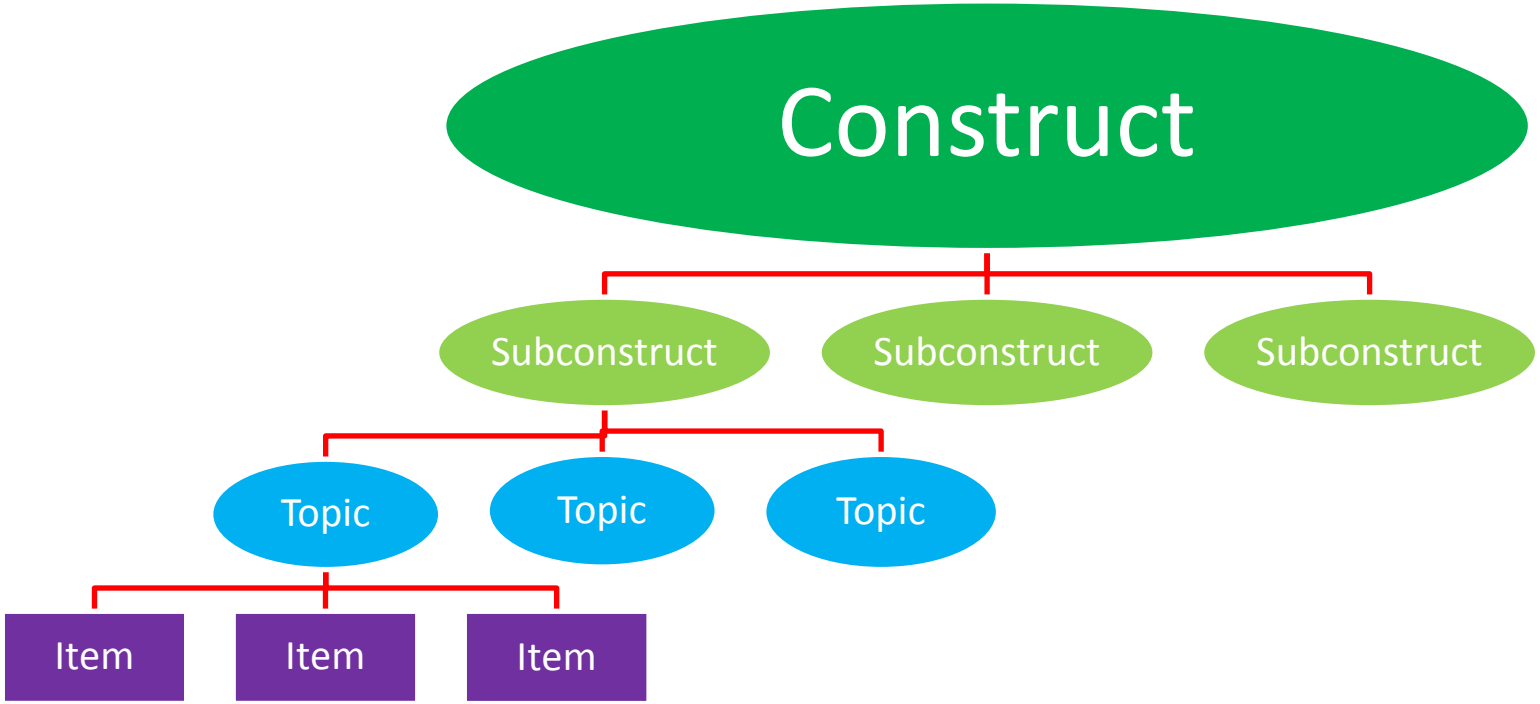
Constructs may consist of multiple subconstructs



Sub-constructs may consist of multiple topics or indicators

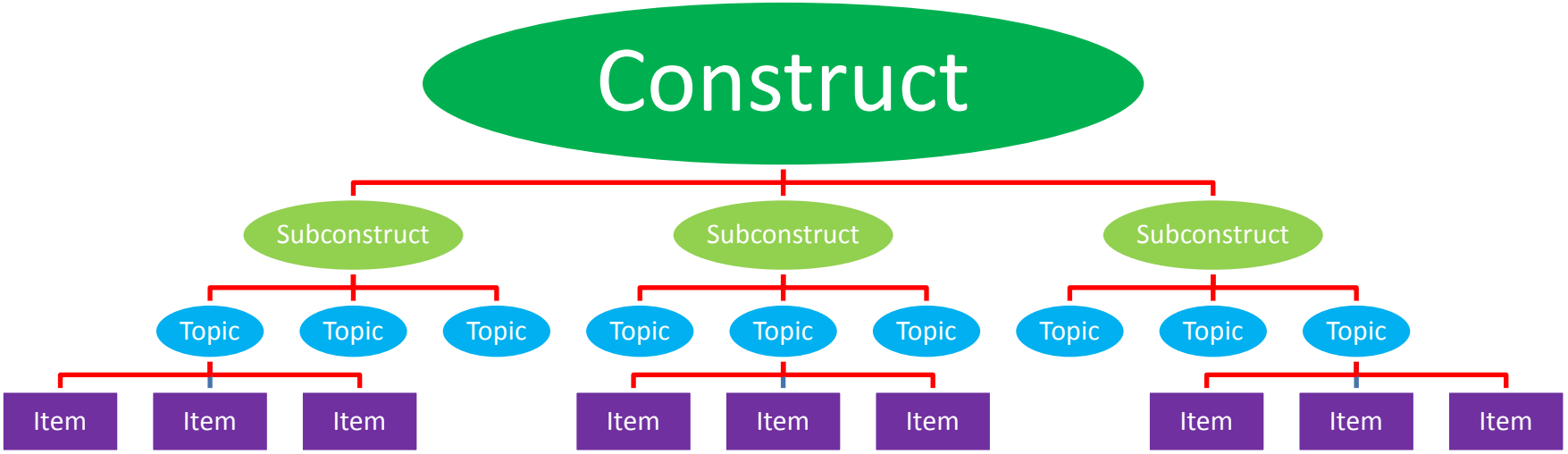


Individual items attempt to measure the topics or indicators

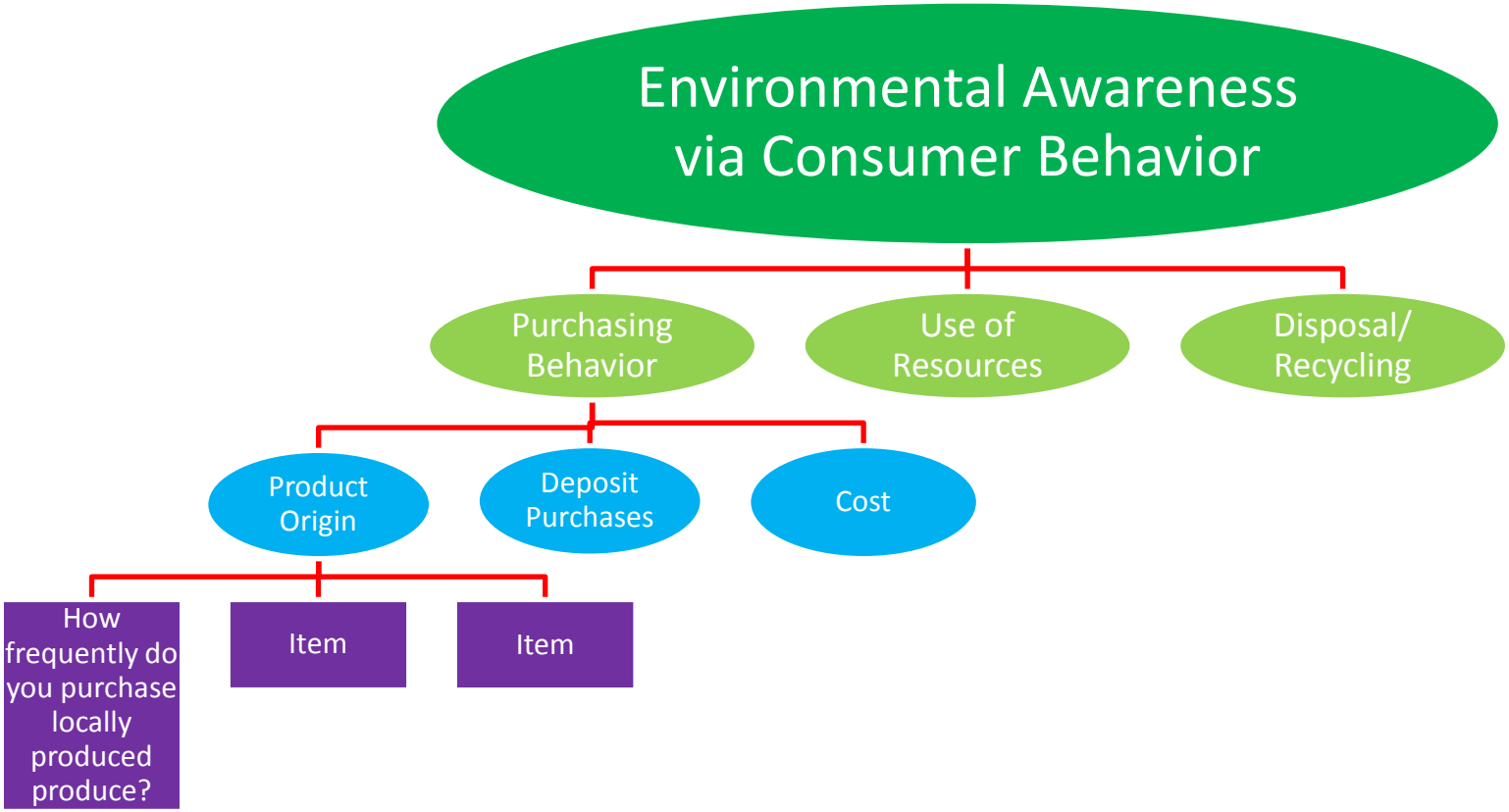


Concept Map

A concept map ensures internal consistency of your study from your research questions, through your data collection, and your results.



An Example



Construct Definition

- What is the construct?
- What is not the construct?
- What is related to the construct?
- What is not related to the construct?

Using Literature to Define Your Construct

- What does the existing literature tell you about your construct?
  - What theories have been proposed about your construct?
  - What existing measures relate to your construct?
- What gaps are there in the literature about your construct?
  - How can these gaps be filled by literature on related constructs?

Using Qualitative Research to Define Your Construct

- Determine whether ideas that underlie the construct make sense to respondents
- Understand its meaning for individuals
- Understand its complexity as it naturally occurs in people's lives
- Consider the multiple external forces that shape and are shaped by this phenomenon
- Reveal the natural, everyday language that people use to talk about a concept

DeVellis, 2011; Plano Clark & Creswell, 2014

Mixed Methods Instrument Development Designs

Grounded Theory

- Particularly well-suited for defining a construct for which you want to develop a measure (Howell Smith, 2011)
- Intent is to produce strong substantive or formal theories where none existed previously (Glaser & Strauss, 1967)
- Used to build theory through a "systematic, inductive, and comparative" process (Bryant & Charmaz, 2007, p. 1)

The Role of Theory

- “A theory does more than provide understanding or paint a vivid picture. It enables users to explain and predict events, thereby providing guides to action” (Strauss & Corbin, 1998, p. 25).
- “Generating theories about phenomena, rather than just generating a set of findings, is important to the development of a field of knowledge” (Strauss & Corbin, 1998, p. 22-23).

Characteristics of Grounded Theory

- Theoretical sampling
  - Participants are selected who can best inform your phenomenon/construct
- Data are concurrently collected, coded and analyzed (constant comparison)
  - Ensures the saturation of relevant categories (Glaser & Strauss, 1967)

Grounded Theory Analysis

1. **Initial Phase**
   - Naming each word, line or segment of data (Charmaz, 2009)
   - Strive for "in vivo" coding – using the participants own language and imagery (Chesler, 1987)
2. **Selective Phase**
   - Sort, synthesize, integrate, and organize initial codes (Charmaz, 2009)
3. **Analytical Phase**
   - Shapes the clusters into an interpretive theory based on the "imaginative understanding of the studied phenomenon" (Charmaz, 2006)

Construct Definition

Whether based on existing theory, related literature, or exploratory qualitative research, your construct definition ought to include:

- What your construct is
- What your construct is not
- What your construct is related to
- What your construct is not related to

Example Construct Definition

- **Kindness** is the *intent* behind doing something nice for someone else
  - Doing something nice for someone else because you expect something in return is not true kindness
- **Kindness** is the *perception* of niceness regarding someone else's actions towards you
  - Regardless of the person's intent, you may experience their actions as kindness

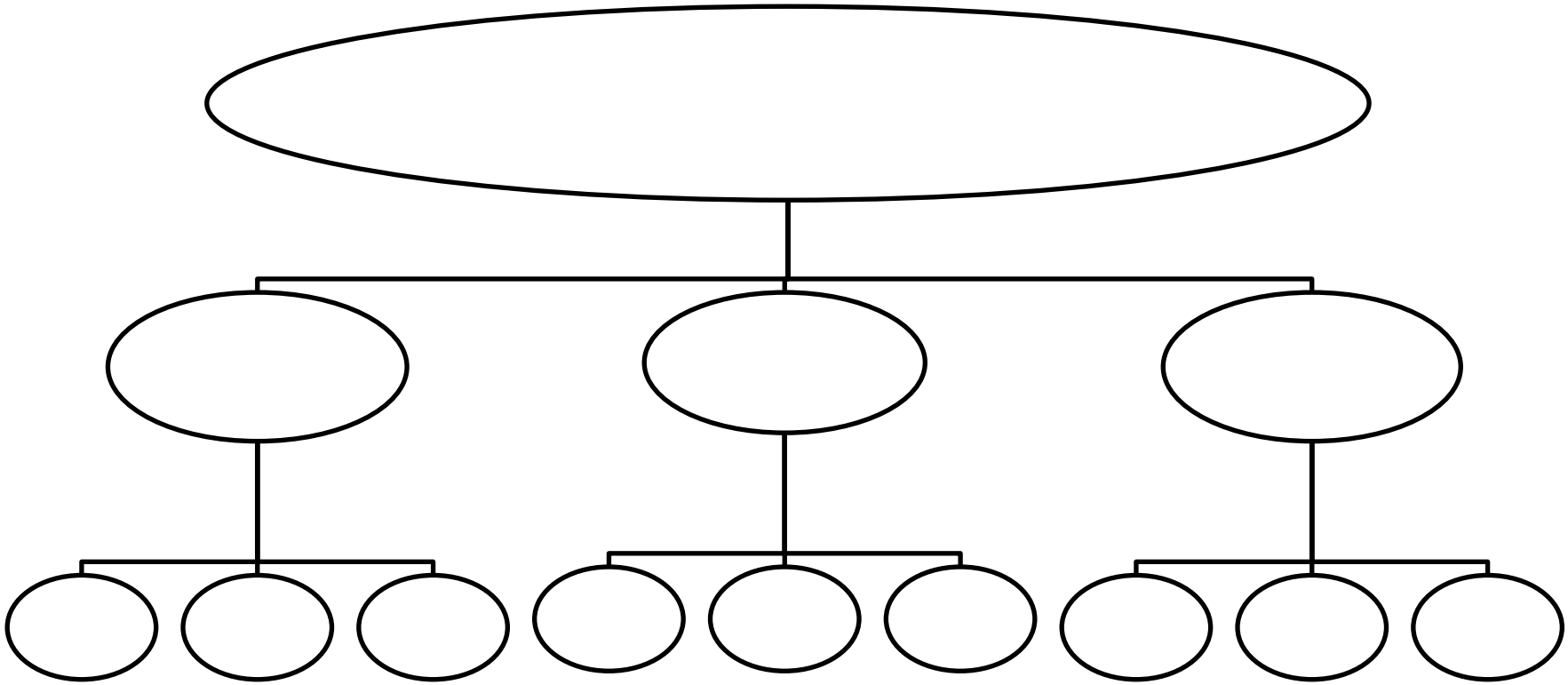
Sue Swearer, study in progress

Example Subconstructs

- Convenience
- Reciprocity
- Recognition
- Rank
- Empathy
- Impact of Actions
- Self-kindness

Sue Swearer, study in progress

Your Concept Map



SO YOU KNOW WHAT YOU WANT TO MEASURE…

Look for existing instruments that measure your construct

- Published journal articles
- Professional associations
  - Measures of Personality and Social Psychological Attitudes
  - Measures of Political Attitudes
  - Handbook of Marketing Scales
- Inter-university Consortium for Political and Social Research (ICPSR)
  - https://www.icpsr.umich.edu/icpsrweb/landing.jsp
- ETS Test Collection Database
  - http://www.ets.org/test_link/about
  - More than 25,000 tests and other measurement devices
- Mental Measurements Yearbook and Tests in Print
  - www.unl.edu/buros
  - Primarily clinical measures, including tests of ability and personality
- Patient-Reported Outcomes Measurement Information System (PROMIS)
  - www.nih**promis**.org/
  - Rigorously reviewed items across 5 domains: physical functioning, social functioning, emotional distress, pain, and fatigue

Existing Measures

- Adoption: if they fit your construct definition
- Adaption: if they are related to your construct definition
- Be sure to weigh the reliability, validity and credibility of the scale
  - CAUTION: Using an existing scale in a new context changes the established reliability and validity
  - CAUTION: Any alteration to an existing scale changes the established reliability and validity
- Obtain permission from the test author and/or publisher
  - Even scales that are not commercial may have copyrights
  - Respect the intellectual property of others as you would like yours respected

If you need to develop a new measure, you must first consider

MODES OF DELIVERY

Selecting a Mode of Delivery

1. Know who your potential participants are:
   - Young children may need picture prompts and interviewer support
   - Older people may not be comfortable with technology
   - Some respondents may not have reliable access to the internet
   - Many households do not have a landline telephone

For more information about sampling procedures

- See Natalie Koziol's presentation:
  - Analyzing Data from Complex Sampling Designs: An Overview and Illustration
  - http://mapacademy.unl.edu/presentations/methodology-application-series/2014-2015/index.php

Selecting a Mode of Delivery

2. Balance the following considerations:
   - Access: How can you contact them?
   - Context: What is the nature of your construct?
   - Cost: What can you afford to do?
   - Constraints: What barriers are there for participants to complete your measure?

Options for mode of delivery

Self-Administered Modes

- "Pencil and paper" versions
  - Mail
  - E-mail
  - Online
    - Smart phones
    - Tablets
  - In person

Interviewer-Administered Modes

- Structured reading of items and response options
  - Phone
  - In person
  - Via Skype/WebEx

Self-Administered Modes

Disadvantages

- Allows limited complexity (print)
- Longer field time (mail)
- Coverage issues (internet)
- Lacks interviewer support
- Respondent has locus of control
- Potential differences by respondent computer
  - Browser, Internet speed, smartphones, tablets

Advantages

- Supports complex questionnaires (online)
- Timely (online)
- Coverage issues (mail)
- Can use visual stimuli
- Less intrusive
- Less social desirability
- No interviewer effects
- Cheaper
- Reach large geographic areas

Dilman, 2014

Interviewer-Administered Modes

Disadvantages

- Requires well-trained interviewers
- Interviewer effects
  - Social desirability, race/gender, etc.
- Coverage issues
  - Cell phones
- Can be costly (in person)

Advantages

- Interviewer support
- Supports complex questionnaires
- Good quality control
- Timely
- Cost effective for many contacts (via phone)

Dilman, 2014

Multiple Modes

- Multiple modes of delivery may provide greater access to more diverse participants, but also introduces additional error to consider

NEXT STEPS…

Brainstorm some items!

- Just write something down
- Try to write 3-4 items for each topic in your concept map
- Don’t evaluate the items (yet)
- Don’t worry about the response options
- Bring them with you to the next workshop

Constructing and Testing the Instrument

Friday, February 6

- Psychology of survey response
- Guidelines for writing good items
  - Readability
  - Content clarity
  - Special issues with translation
- Context effects and error
  - Questionnaire design
  - Mode effects
  - Visual design considerations
- Pre-testing
  - Expert review
  - Cognitive interviews

Psychometric Review

Friday, April 3

- Reliability
  - Misuses of coefficient alpha
- Validity
  - Construct validation
  - model-testing approaches

Questions?

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