An Overview of Qualitative and Quantitative Methods

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(please don’t forget I am an economist after all)

2010 Summer WAS*IS Workshop
August 12, 2010

Changing from what WAS to what IS the future of integrated weather studies
Social sciences

- Application of the *scientific process* to study & understand *human cognition & behavior*
  - Emphasis on “process”

- Using testable theories, systematic process, and rigorous research to *answer questions* about human society

- Subjects and the theories that describe them constantly change – unlike physical parameters, human society is never static!
Social sciences are true “sciences” – as are physical sciences – with theories, observations, methods, applications – but are harder as human behavior is non-linear, dynamic, and even “chaotic.”
Social science is commonly used as an *umbrella term* to refer to a plurality of fields outside of the natural sciences:

- Anthropology
- Geography
- Communication
- Economics
- Psychology
- Political Science
- Education
- Sociology
- History
- ...
You’ve already heard a lot about methods ...

• Communication – Julie Demuth & Quyen Arana
• Anthropology - Jennifer Spinney & Julie Brugger
• Geography - Kenny Blumefeld & Kate Sammler
• Economics - Jeff Lazo
• Sociology - Lori Peek
• ...

Methods from social sciences can be used in “non-research” situations, discussions, and activities
Diverse methodologies

- Direct observations
- Participatory activities
- Interviews
  - Open interviews
  - Semi-structured
  - Structured
- Focus groups
- Document study
- Experiments
- Surveys
- Analysis of available data ...
- ...

Social sciences
<table>
<thead>
<tr>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The aim is a complete, detailed description.</strong></td>
<td><strong>The aim is to classify features, count them, and construct statistical models in an attempt to explain what is observed.</strong></td>
</tr>
<tr>
<td>Researcher may only know roughly in advance what he/she is looking for.</td>
<td>Researcher knows clearly in advance what he/she is looking for.</td>
</tr>
<tr>
<td>Recommended during earlier phases of research projects.</td>
<td>Recommended during latter phases of research projects.</td>
</tr>
<tr>
<td>The design emerges as the study unfolds.</td>
<td>All aspects of the study are carefully designed before data is collected.</td>
</tr>
<tr>
<td>Researcher is the data gathering instrument.</td>
<td>Researcher uses tools, such as questionnaires or equipment to collect numerical data.</td>
</tr>
<tr>
<td>Data is in the form of words, pictures or objects.</td>
<td>Data is in the form of numbers and statistics.</td>
</tr>
<tr>
<td>Subjective – individuals’ interpretation of events is important, e.g., uses participant observation, in-depth interviews etc.</td>
<td>Objective seeks precise measurement &amp; analysis of target concepts, e.g., uses surveys, questionnaires etc.</td>
</tr>
<tr>
<td>Qualitative data is more 'rich', time consuming, and less able to be generalized.</td>
<td>Quantitative data is more efficient, able to test hypotheses, but may miss contextual detail.</td>
</tr>
<tr>
<td>Researcher tends to become subjectively immersed in the subject matter.</td>
<td>Researcher tends to remain objectively separated from the subject matter.</td>
</tr>
</tbody>
</table>
Weather Comprehension Survey (or why do methods matter?)

Q1 Do you know what a warning means?
- Yes
- No

But what was the respondent really THINKING?

Q1a Do you know what a warning means?
- Yes – and don’t expect me to explain my answer
- Yes - because I flipped my yes/no coin and it came up “Yes”
- Yes – because if I answer “yes” you’ll leave me alone.
- Yes – because based on that look on your face, I suspect that is the right answer.
- Yes – because if I didn’t I would probably look stupid.
- Yes – because that is the first response option
- Yes – a warning means “A warning is issued when a hazardous weather or hydrologic event is occurring, is imminent, or has a very high probability of occurring. A warning is used for conditions posing a threat to life or property” ¹

- No - because I flipped my yes/no coin and it came up “No”
- No – because it depends on what you mean by “know”
- No – because if I don’t maybe you’ll go away ...
- No – because I really don’t know what a warning means . . .

¹http://www.crh.noaa.gov/glossary.php?letter=w
To survey or not to survey? That is the question . . .

- Problem definition . . .
  - What question am I trying to answer?

- Objective
  - What information do I need?
  - Who do I need it from?
  - How much information do I need?
  - What will I do with the information?
  - How will I analyze the information?
  - How and to whom will I present the results?

- Is a survey the correct method?
Different types of surveys

- attitudinal
- behavioral
- information gathering (economic surveys)
- valuation
Advantages to surveys

- **Gathering Information**
  - Efficient for collecting large amount of information
  - Flexible to collect wide range of information
    - attitudes, values, beliefs, and past behaviors.

- **Questions**
  - Standardized - relatively free from several types of errors
  - Researcher can ask more complex questions
  - Diminished response effect
    - willing to divulge more info w/o face-to-face contact
    - less likely to try to impress interviewer

- **Administration**
  - Relatively easy to administer
    - Computer-based – automatic data entry
  - Economy in data collection

- **Analysis**
  - Statistical techniques to determine validity, reliability, and statistical significance
Disadvantages to surveys

• Gathering Information
  – Questions must be general enough for all respondents
  – Non-literate or illiterate populations
    ▪ only English-speaking populations
    ▪ hard-to-reach populations – “vulnerable populations”

• Questions
  – Can’t determine subjects’ motivation, memory, and ability to respond
  – Not appropriate for studying complex social phenomena
  – Subjects may not answer honestly
  – No control over participant interpretation

• Administration
  – Low response rates
  – Respondents usually self-selected
    ▪ Uncertainty about who actually filled out the questionnaire

• Analysis
  – Statistical techniques to determine validity, reliability, and statistical significance
Constraints on surveys

• Regulatory constraints
  – Paperwork Reduction Act / OMB
  – Human Subjects / Institutional Review Board

• Costs and time resources for survey research
  – natural resources damage assessment (NRDA)
  – grad students and pizzas
Issues to quickly mention

- **Survey Biases**
  - social desirability bias
  - interviewer bias
  - non-response bias
    - item non-response
  - measurement bias
  - hypothetical bias
  - information bias

- **Validity** - it measures what it’s supposed to measure.
  - face validity
  - content validity
  - criterion validity
  - predictive validity
  - concurrent validity
  - construct validity
  - discriminant validity

- **Reliability** - yields consistent results
  - inter-observer
  - test-retest
  - parallel-forms
  - split-half reliability
National Survey of Nonprofit Organizations

Figure 1: Survey Design and Implementation Procedures

Stage 1: Planning and Development of Survey
- Collect background data for planning survey design
- Prepare questionnaire outline
- Develop preliminary sampling design
- Plan preliminary operations
- Draft preliminary analysis plan and report outline

Stage 2: Pretest
- Draft preliminary sampling frame
- Select pretest sample
- Prepare questionnaire
- Prepare pretest questionnaire
- Hire subcontractor
- Pretests (2)

Stage 3: Final Survey Design and Planning
- Develop sampling plan
- Revise questionnaire
- Revise final codes
- Revise survey and design operations plan
- Revise analysis plan; Draft final report outline

Stage 4: Implementation of Survey and Data Collection
- Select sample
- Establish sample control
- Prepare final questionnaire
- Coordinate and manage project with subcontractor
- Collect data
- Reduce data
- Edit data
- Coding
- Data entry
- Cleaning
- Check data quality
- Verification
- Validation
- Prepare raw data file

Stage 5: Data Coding and Data-File Construction
- Collect data
- Reduce data
- Editing
- Coding
- Data entry
- Cleaning
- Prepare raw data file

Stage 6: Research and Analysis of Data
- Collect data
- Reduce data
- Analyze data
- Data editing
- Coding
- Data entry
- Cleaning
- Prepare data file
- Draft report
- Prepare final report

Adapted from Czaia and Blair (1996)

http://www.amstat.org/sections/srms/pamphlet.pdf
Survey research – components

- Survey design
- Sampling
- Implementation
- Analysis and reporting
Survey design

Technical background

Preliminary survey design

• introduction
  – tell respondents purpose of the survey
• providing information
• how to ask the correct questions
• response categories
• socio-demographic information
• de-briefing questions
Survey design

Focus-groups
- Also important as qualitative research tool
- Ex: focus-group 9/10/2001 – Poughkeepsie, NY

One-on-one cognitive interviews
- verbal protocols
  - think alouds
- retrospective reports

Pre-testing survey
- survey instrument
- implementation method
- analysis planning
Survey design

• Parts of a survey
  – Introduction
  – Filtering questions
  – Content questions
  – Socio-demographic questions
  – Debriefing questions

• Other considerations
  – Instructions
  – Formatting
Peer review

- Research objective . . .
- technical information
- sampling plan
- implementation plan
- formatting and presentation
- questions and survey language
  - “Uncle George test”
- analysis plan
Sampling

- **Population, Units, Subjects and Samples**
  - Population: entire group of people about which information wanted.
  - Units/subjects: Individual members of the population are called units
  - Sample: part of population examined

- **Error**
  - Sampling: not surveying all elements of population
  - Coverage: not allowing all members of the survey population to have an equal or nonzero chance of being sampled

http://www.gseis.ucla.edu/courses/ed230a2/notes2/sampling.html
Sampling

• Types of Samples
  – Voluntary response sample
  – Convenience (accidental, haphazard) sample
  – Snowball ...
  – Simple random sample
  – Stratified random sample
  – Cluster random sample
  – Multistage sample design
Implementation

methods for survey implementation

- telephone
- in-person
- internet
  - Knowledge Networks type of access
  - ResearchExec
- mixed mode – e.g., telephone/mail
- mail
  - the mail survey “package” – Dillman Total Design Method (TDM)
    - pre-contact
    - cover letter
    - survey instrument
    - return envelope
    - incentive
    - reminder post-card
    - follow-up
Analysis and reporting

• QA/QC
• response rate – AAPOR
• socio-demographics of pop / sample / respondents
• analysis methods
  – content analysis
  – factor analysis
  – latent class variable analysis
• quantitative analysis
  – summary data
  – basic statistical analysis
  – econometric modeling
Survey analysis (examples)

• Univariate analysis
  – Histograms, tables, charts, etc.
  – Mean, median, mode
  – Range, standard deviation

• Bivariate analysis
  – Crosstab/contingency tables
  – Correlations (Pearson’s r, Spearman’s rho, phi, Cramers V)

• Regression analysis
  – Logistic, ordinal, linear, etc.

• So much more!
Asking the question

How often do you use weather forecasts in planning for each of the activities listed below? Please remember that we are asking about how you use the weather forecast for planning activities (not on how you may change plans based on what the weather actually is at the time you do these activities). Circle the number of your answer for each item.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never</th>
<th>Rarely</th>
<th>Half the time</th>
<th>Often</th>
<th>Most of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dressing yourself or your children for the day</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>How to get to work, school, or the store</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Job or business</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>House or yardwork</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Social activities</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Vacation or travel</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Planning for the weekend</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Conclusion

- Many rules
- Many resources
- Beg, borrow, and steal!

No such thing as perfect sample or survey or study - so, sometimes better to plow ahead
Literature


Online resources

• The American Association for Public Opinion Research: http://www.aapor.org/

• Survey Research Center –University of California, Berkeley: http://srcweb.berkeley.edu/index.html

• Survey Research Center –Centers of the Institute for Social Research (ISR). –University of Michigan: http://www.isr.umich.edu/src/