Survey Research

“"A comprehensive system for collecting information to describe, compare or explain knowledge, attitudes and behaviour over large populations”"}

● good for
  ● Investigating the nature of a large population
  ● Testing theories where there is little control over the variables

● limitations
  ● Relies on self-reported observations
  ● Difficulties of sampling and self-selection
  ● Information collected tends to subjective opinion

See:

What is Survey Research?

● Survey Research ≠ Questionnaires
  ● Can use questionnaires in any method
    ● E.g. pre- and post- test in experiments
  ● Can do survey research without questionnaires
    ● E.g. using interviews, data logging, etc

● Distinguishing features:
  ● Precondition: a clear research question that asks about the nature of a particular target population
  ● selection of a representative sample from a well-defined population
  ● data analysis techniques used to generalize from that sample to the population
  ● Most suitable for answering base-rate questions
When to use Survey Research

- To evaluate the **frequency** of some characteristic across a population
  - E.g. how many companies use agile methods?

- To evaluate the **severity** of some condition that occurs in a population
  - E.g. what’s the average cost overrun of software projects?

- To identify factors that **influence** a characteristic or condition
  - E.g. What factors cause companies to adopt new ASE tools?

Starting point

- Set clear objectives
  - A hypothesis to be tested
  - Any alternative explanations to be investigated
  - Identify a scope for the study appropriate for the objectives
  - Identify resources needed to meet the objectives

- Check that a survey is the right method:
  - Is it clear what population can answer the questions reliably?
  - Is there a way to get a representative sample of that population?
  - Do you have resources to obtain a large enough sample?
  - Is it clear what variables need to be measured?
  - Is it clear how to measure them?
I. Probability Sampling

- Simple random sampling
- Stratified random sampling
- Systematic random sampling
- Cluster random sampling
- Multi-stage sampling

II. Non-probability Sampling

- Convenience sampling
- Purposive sampling
- Expert sampling
- Quota sampling
- Modal sampling
- Heterogeneity sampling
- Snowball sampling
Avoiding Sampling Bias

- Clear definition of the survey sample:
  - Define the $U$, the unit of analysis
  - Define the $P$, the target population
  - ...such that $P = \{U\}$
  - Sample of the entire target population
  - not just the most accessible portion of it!

- Stratified Random Sampling for confounding variables:
  - E.g. $U =$ individual developer,
    $P =$ developers working in Canadian software companies
  - ... but what if 80% of our sample comes from a single, dominant company?
  - If we really wanted $U =$ Canadian Software Companies
    - Then change $P$
  - Alternatively, if company is a confounding variable
    - Group population by company, then sample within each

Survey Study Designs

- Cross-sectional design
  - Used to obtain a snapshot of participants’ current activities.

- Case-control design
  - Asks each participant about several related issues
  - Used to establish whether a correlation exists between certain phenomena, across the population.

- Longitudinal study
  - Administer a survey periodically to track changes over time

- Cohort study
  - A longitudinal study that tracks the same participants each time
Avoiding Self-selection Bias

- Sampling the right population might not be enough
  - Low response rates (e.g., under 10%) are common
  - Low response rates may invalidate the sampling method
  - Participants who choose to respond might be unrepresentative:
    - E.g., People who are least busy
    - E.g., People who have a strong opinion on the research topic

- Probe reasons for low response rate
  - E.g., follow up phone calls to non-respondents

Create a survey instrument

- Use/adapt other people’s instruments if possible
  - Existing instruments have already been validated
  - Makes it easier to compare research results

- Challenges:
  - Phrase the questions so all participants understand them in the same way
  - Closed questions:
    - Hard to give appropriate choices of answer
    - Hard to ensure all respondents understand the choices in the same way
  - Open questions:
    - Hard to analyse the responses

- Prototyping and validation
  - Test that participants can understand the questions
  - Test how long it takes them to answer
  - Use prototyping results to improve the instrument
## Question Design

- Questions must be unambiguous and understandable:
  - Language appropriate to the population
  - Use standard grammar, punctuation, spelling
  - Each question covers exactly one concept
  - Avoid vague or ambiguous qualifiers
  - Balance positive and negative questions

- Typical mistakes:
  - Questions that participants can’t answer
    - E.g. asking about decisions they weren’t involved in
  - Double edged questions
    - E.g. “have you used SE tools or techniques, or would you consider using them?”
  - Leading questions
    - E.g. “did the project fail because of poorly managed requirements?”
  - Appropriation - reinterpreting participants’ responses

## Answer Design

- Response Categories
  - Numeric values (e.g. number of months on the project)
  - Nominal categories (e.g. type of software being built)
  - Binary (e.g. Yes/No)
  - Ordinal scales (e.g. “how strongly do you agree with this statement...”)

- Response options should be:
  - Exhaustive (but not too long!)
    - Include ‘other’ if you cannot ensure they are exhaustive
  - Mutually exclusive
  - Allow for multiple selections if appropriate

- Using ordinal scales:
  - Use 5 - 7 points on the scale
  - Label the points on the scale with words
  - End points must mean the opposite of one another
  - Intervals must seem to be evenly spaced
Reliability

- **Test-Retest Reliability**
  - If the same person answers the survey twice, do you get the same answers?
  - Problems:
    - What if the world has changed?
    - What if answering the questionnaire changes their attitude?
    - What if they just remember their answers from last time?

- **Alternate Form Reliability**
  - Do re-worded or re-ordered questions yield the same results?

- **Inter-rater Reliability**
  - If someone else administers the questions, do you get the same answers?
  - If someone else codes the responses, do you get the same results?

Surveys vs. other methods

- **Use survey research when:**
  - You need to find out what’s true across (some part of) the s/w industry
  - Establish what is normal, common or uncommon.

- **Use case study when:**
  - You want to understand what developers actually do
  - Deeper insights into what happens in a small number of selected cases.

- **Use an experiment (or quasi-experiment) when:**
  - You want to investigate whether a particular technique has an effect on quality, development time, etc
  - Tests for a causal relationship.

- **Use an ethnography when:**
  - You want to understand the culture and perspective of developers
  - Probes how developers themselves make sense of their context

- **Use action research when:**
  - You need to solve a pressing problem, and understand whether the solution was effective
  - Focusses on effecting change, and learning from the experience