

# Quantitative and Qualitative Research

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Research Methods - Barbara Russo

SwSE - Software and Systems Engineering

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# Source

- Carolyn Seaman University of Maryland  
Baltimore (2013)
- [http://ccsl.ime.usp.br/files/  
QualMethods%20minicourse%20USP-1.pdf](http://ccsl.ime.usp.br/files/QualMethods%20minicourse%20USP-1.pdf)

# Definition

- **Qualitative methods** provide data in the form of words (or maybe visually)
- **Quantitative methods** generate numerical data
- Quantitative and qualitative methods of data collection are often **employed in support of each other** on the one research project.

# Types of qualitative data

- **Qualitative data** - data in the form of text and pictures
- **Qualitative analysis** – analysis of qualitative data in order to discover trends, patterns, and generalisations

# Techniques for qualitative analysis

- **Grounded theory** – theory formed bottom-up from the qualitative data
- **Rich data** – data that includes a lot of explanatory and context information (e.g., interviews)

## Quantitative

**Objective** is to test hypotheses that the researcher generates

**Concepts** are in the form of distinct variables

**Measures** are systematically created before data collection and are standardized as far as possible; e.g. measures of job satisfaction.

## Qualitative

**Objective** is to discover and encapsulate meanings once the researcher becomes immersed in the data

**Concepts** tend to be in the form of themes, motifs, generalizations, and taxonomies.

**Measures** are more specific and may be specific to the individual setting or researcher; e.g. a specific scheme of values

## Quantitative

**Data** are in the form of numbers from precise measurement

**Theory** is largely causal and is deductive

**Procedures** are standard, and replication is assumed

**Analysis** proceeds by using statistics, tables, or charts and discussing how they relate to hypotheses.

## Qualitative

**Data** are in the form of words from documents, observations, and transcripts. However, quantification is still used in qualitative research.

**Theory** can be causal or non-causal and is often inductive

**Procedures** are particular and replication is difficult

**Analysis** proceeds by extracting themes or generalisations from evidence and organizing data to present a coherent, consistent picture. These generalisations can then be used to generate hypotheses.

# Outcome of qualitative studies

- Propositions tied to a trail of “evidence”
- Well-grounded hypotheses
- Complex findings that incorporate the messiness of the phenomenon under study
- Explanations
- Areas for future study

# Research questions

- Qualitative methods are most appropriate when:
- Subject of study involves **human behaviour**
- **No concrete hypotheses**
- Variables **hard** to define or quantify
- **Little previous work**
- Quantitative results may be **hard to interpret**

# Qualitative pros

- Richer results
- Results more explanatory
- Closer to sources of data
- Avoid errors in interpretation

# Example

- Make your example here

# Qualitative method - Grounded Theory

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# Grounded Theory

- The Corbin / Strauss approach
  - J. Corbin and A. Strauss. **Grounded theory research: Procedures, canons, and evaluative criteria.** *Qualitative Sociology*, 13(1):3–21, 1990
- Examples from the article
  - C. Treude and M. Storey. 2011. **Effective communication of software development knowledge through community portals.** In Proceedings of the 19th ACM SIGSOFT symposium and the 13th European conference on Foundations of software engineering (ESEC/FSE '11)

# When to use - examples

- Used on free text
  - scripts from interviews
  - messages in commits
  - log messages
  - requirement documentation
  - comments in code
  - etc.

# Grounded theory techniques

- Open coding
- Axial coding
- Selective coding

# Open coding

- Read through your data several times and then start to **create tentative labels** for chunks of data that summarise what you see happening (not based on existing theory – just based on the meaning that emerges from the data).
- Record examples of participants' words and establish properties of each code

# Approaches to open coding

- Break the back log
  - line by line
  - sentence by sentence
  - paragraph by paragraph
  - whole document

# Example of reading - line by line

- Data is annotated line by line
- Concepts are created when they are present repeatedly
- Based on the concepts, more abstract categories are developed and related.
- Each category has properties, dimensions, conditions, and consequences

94 long-term partnership so I've never been sort of out of partnerships  
95 so it's not been too bad. For years and years I've lived with people.  
96 But when I've had domestics and things like that, well you see, I  
97 left home at fifteen years old and I've never been back to live with  
98 my mum and dad. I'm one of them sorts of people who don't like  
99 going and lying about on friends' couches or putting on people. So  
00 really, yes, if I've had domestics and that, I've gone and slept in  
01 'car – for days on end sometimes. But really this is my first time  
02 that I've actually come away from everybody and lived by meself.  
03 I have been homeless but I've never had a place by meself. I'm just,  
04 like, one of them sorts of people that doesn't like putting on other  
05 people. My problem is with me long [term] relationships. I make  
06 friends easy when I'm in relationship. I get a lot of friends but

*Long term relationships*  
*Partnerships acceptable.*  
*Shared accomm.*  
*Domestics*  
*Chose independence*  
*Characterises self as*  
*independent*  
*Not reliant on others*  
*Domestics*  
*Slept in car*  
*Hostel seen as live alone*  
*Never lived on own*  
*Sees self as not reliant*  
*Relationships a problem*  
*Make friends easily*

# Axial coding

- Identify relationships among the open codes.  
What are the connections among the codes?

# Selective coding

- Figure out the core variable that includes all of the data
- Then re-read the transcripts and selectively code any data that relates to the core variable you identified
  - The core category is then systematically related to other categories

# Exercise

- See exercise on moodle