Research methods

Quantitative vs. Qualitative, I

Typical features, but not necessarily a clear separation -

Quantitative	**Qualitative**
Working with numbers	Working with texts or oral material
Clear, operational problem statement before the survey	Development of the problem is often part of the survey
Tend to focus on the **analysis**	Tend to focus on the **synthesis**
Important to keep problem setting and questions stable during the main study, often also between different surveys. Keywords: **comparability**	Can easily change the topic from the experiences along the way. Key words: **flexibility**
Strong demand for control of variables, repeatability	Harder to require repeatability
Strives for objectivity	Subjectivity is difficult to avoid
Clear division of the various phases	Phases do often overlap
Emphasis on significant relationships, testing of hypotheses	Emphasis on understanding, but often difficult to draw significant conclusions
Single findings are unimportant in itself. Special findings may, however, interfere with a hypothesis or research question	Single findings may be important in itself
Many trials / interviews, but not so deep	In-depth interview with a small number of persons is very common – look for overall understanding
Describe	Understanding (Michael Argyris, "supports a more generous view of man").

NB! Very similar discussions to systems development methods etc.

Method Type:

traditional / phase oriented /

experimental/ prototype/

Quantitative vs. qualitative methods, II

Examples of issues

tend toward

Quantitative **Qualitative**

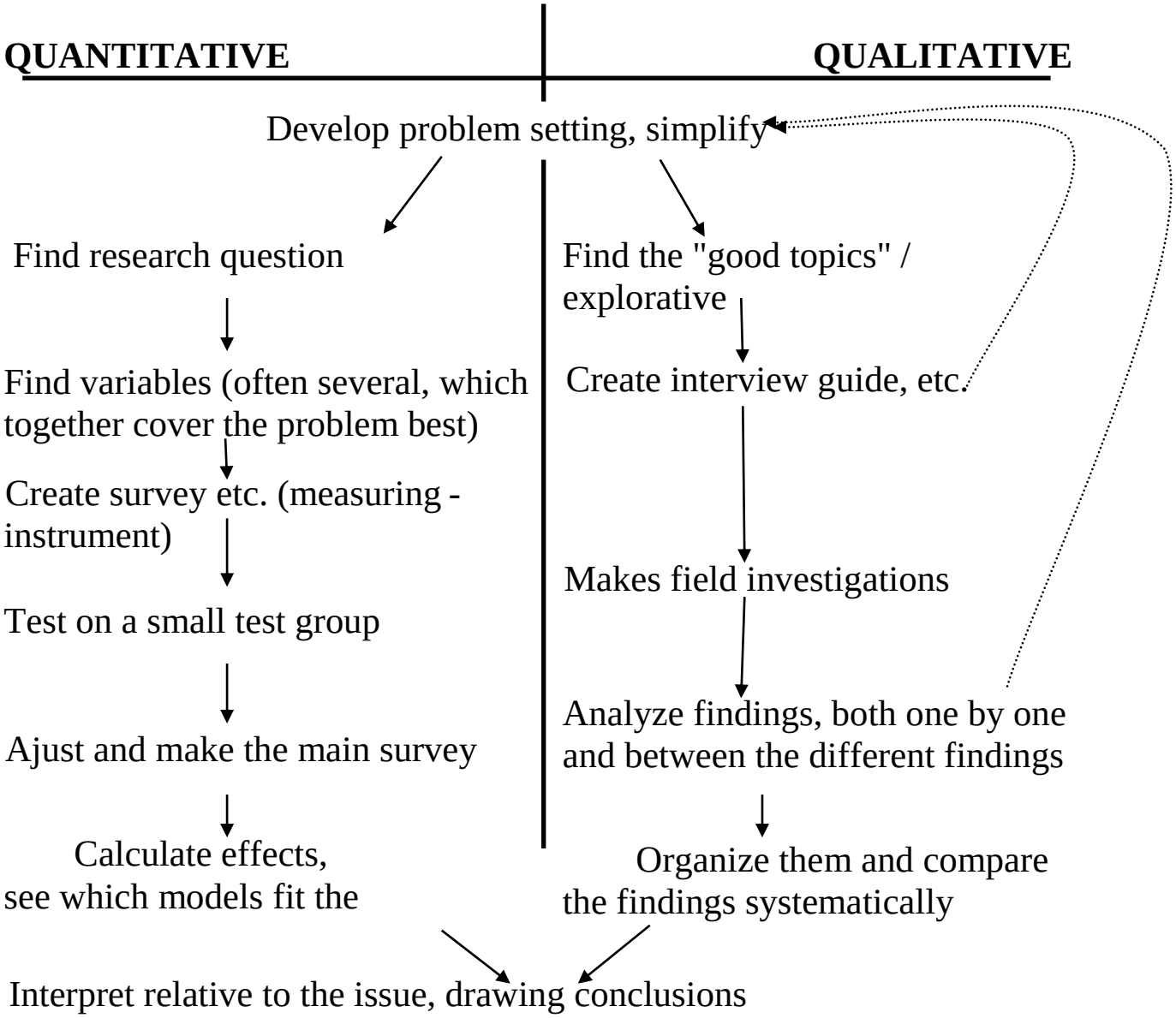
How often do Norwegians in the church?	Assessment of own religious beliefs
How big is the failure rate at the various colleges?	How do you experience you study situation?
How strong correlation (positive or negative) is there between income and personal consumption?	What has made your life difficult in the past?
What are the main causes of unemployment?	How is "trouble in school" developing?
Is the occurrence of cod significantly less in the Oslofjord this year than last year?	Suggestions for what can make our city more attractive.

Discussion: *Do you agree with this classification?*
Other comments, e.g. on "what is research"?
Make your own examples!

A number of studies are done over a longer time
- *examples?*
- *how can this be done, and*
- *is the most quantitatively or qualitatively?*

Quantitative vs. Qualitative methods III

Typical procedure - simplified



The dots show the most **typical iteration/loopback,** ie, where one goes back in the process and make changes, and then follow the process again.

Again, highly parallel analytical vs. experimental system.

Discussion: *Imagine a project, define operational variables.*

Quantitative vs. qualitative methods, IV

- And last!

Main difference

- A **quantitative** study tends to investigate **phenomena which are easy to describe in numbers.**
- A **qulitative** approach is more natural if **the phenomenon is not well known, and initial theories is necessary** - but of course also be used in other contexts.
- A **qualitative** study has less firm specific problem and method, thus **more iteration between study and research,** cf. previous page.

Combination of both method types

- Often, parts of a qualitative study is quantified, but one then often loses full understanding.
- Ditto: can record "qualitative aspects" of an otherwise quantitative problem position, but they can often draw very clear, generalized answer.
- Sometimes, one uses a combination, eg. given answers for quantitative questions along with open-ended additions, as follows:
  Comments / own views: _____
- Alternatively: Survey for many along with in-depth interviews with a few.
- More generally, "triangulation", i.e. using several different methods. If they point in the same direction, it strengthens the conclusions drawn.

Discussion

- *Philosophical: is it that **everything** can be quantified?*
- *Is it true that everything **should** be quantified*
- *What is the connection between these research traditions and **"hard"** and **"soft"** parts of a subject?*

Quantitative methods, I.

Often done via questionnaires and the use of different interview techniques

- Frequently, one make a selection, for example a portion of the population
- Important to get a representative sample, the use of random selection or stratification (random selection within groups with known characteristics)
- Some techniques:
  - transmission or distribution of a questionnaire
  - interviews with questionnaires, interviews ticks
  - telephone interviews with questionnaires, interviews ticks
  - IT-based questionnaires
- Various selection methods and questioning techniques has advantages and disadvantages

Using statistical methods

- we often want to measure co-variation between an independent variable and a dependent variable
- the ideal form natural science tends to be frezing all variables except one independent and one dependent, and look at the context - ie, y = f (x) - but this is often not possible. Alternatively: use a random selection - randomizes any differences.
- formulas etc. are often embedded in
  - advanced calculators
  - spreadsheet program.
  - statistics packages - can be used for more complex calculations.

Quantitative methods, II.

Simple statistical methods

Sample data for this page: 0, 1, 4, 5, 5.

Central Tendency:

- Simple average calculation:

  From the observations $x_1, x_2, ..., x_n$ we calculate $= (x_1 + x_2 + .. x_n) / n$, i.e.

  $\bar{x} = \sum_1^n x_i / n$. Says something about the central tendency. Above: $\bar{x} = 3$
- Median: the middle number (sorted) Above: M = 4
- Type number: the most freequent observation Above: T = 5
- Other methods including
  - running average
  - exponentially smoothed average

Variation:

- (Empirical) variance.

$$\widehat{\mathrm{Var}}[X] = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x}_n)^2$$ Frequently, one use 1/n instead of 1/(n-1).

Above: 22/4 = 5.5.

- (Empirical) Standard Deviation. The square root of the variance, i.e.

  $$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}.$$ Frequently used 1/n instead of 1/(n-1).

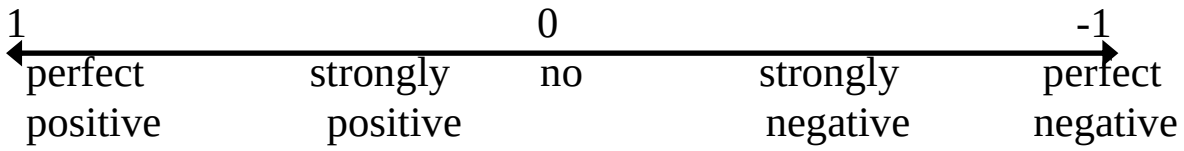
  Above: $\sqrt{5{,}5} \approx 2.35$.
- Average deviation. As the variance, but use absolute value of difference instead.

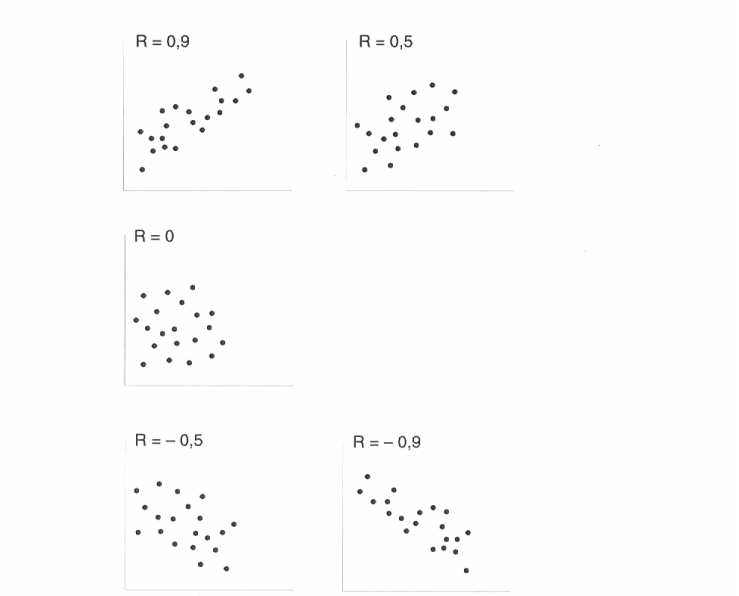
  Above: 10.4 = 2.5.

NB! In statistics, one distinguishes between empirical and theoretical reasoning.

Quantitative methods, III.

Linear Regression - Pearson's product-moment coefficient, R, measures the extent of **correlation.** R always lie between -1 and 1. R^2 is a measure of how much of the variation of y that can be explained by the variation in x. Eg: R = 0.8 means that 64% of the variation in y can be explained by the variation in x.





(From Holme & Solvang)

Figur 15.25 *Grafisk bilde av observasjonene ved ulike verdier for R (Bhatta-charyya, Johnson, 1977)*

Formula:

$$r_{x,y} = \frac{\frac{1}{n}\sum_{i=1}^{n}(x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \overline{x})^2}\sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - \overline{y})^2}}$$

Merk: Denominators are standard deviations for x and y, resp.

In addition, we often make a so-called regression line, the straight line that "best" reproduces the trend in the figures. The standard method for to find this is called the least squares method. *Hint: Search eg. "Linear regression" on the web - you'll see many examples of the use of the technique.*

Note: We are talking about linear regression. Even if | R | is small, the data can be a good fit to for example a parabola, a hyperbola etc.

Quantitative methods, IV.

Correlation vs. causation

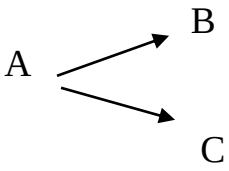
Which way is the cause?

If A correlates with B, it may mean:

- A causes B, A ⟶ B
- B causes A, B ⟶ A
- no causualilty

Knowledge of the field is only way to determine this!

Hidden / underlying variables, for example



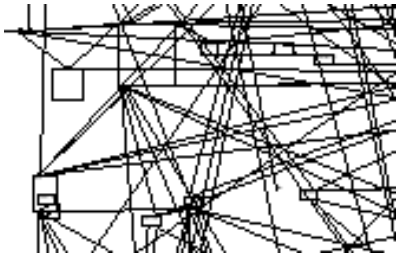
B and C are correlated, but both are controlled by A
Often called **spurious correlations.**

Other relationships, conditional relationships.

A ⟶ B ⟶ C

- Although there is a correlation between A and C, this may be indirect, ie, with an intervening causation.
- Although there is no correlation between A and C can still be corration A → B (eg. negative) and B → C (eg. positive).
- A correlation A → B may apply only under certain conditions or email for certain ranges of data.

What's the connection?



In reality, there are a number of factors that influence each other. Often created a graph to show possible relationships. These surveyed to determine the degree of correlation ==> possible causes.

Important:

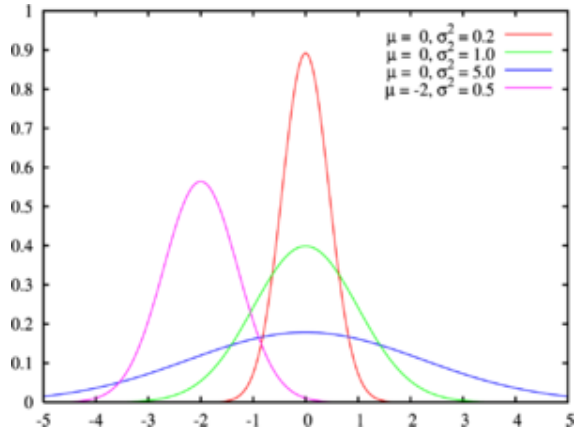
learn the difference between **correlation** and **causation!**

Quantitative Methods, V.

Statistical distributions.

There are a number of distributions which may be used, for example.

- binomial distribution
- hypergeometric distribution
- normal distribution, often called the Gaussian curve.



μ (mu) = theoretical average.
σ (sigma) = theoretical standard deviation

Notice

- symmetry, average form top
- difference between the curves with small and large standard deviation

Drawing from http://da.wikipedia.org
"Everything" trend towards a normal distribution.

Some statistical methods

- **Multivariate analysis** - find correlation between many variables
- **Testing of hypotheses,** comparison between the null hypothesis (H_0) and alternaterative hypothesis (H_A) to find whether this is significant or not, for example via
  - χ^2 Tests
  - test against various distributions, eg. normal distribution
  - "We can say with 95% probability that H_A is correct, so that H_0 rejected ". However: since we normally do not know if H_0 is true or not, we cannot be absolutely sure!

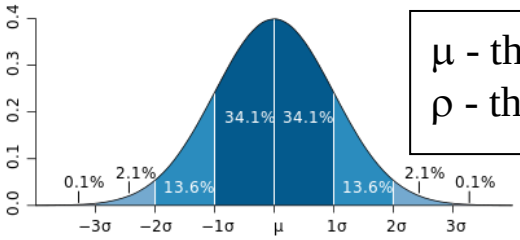
	H_0 is true	H_0 is false
We accept H_0	OK	acceptance error
We reject H_0	Rejection error	OK

- The same problem as in court!

The probability for a false conclusion is often called the p value.

Quantitative Methods, VI.

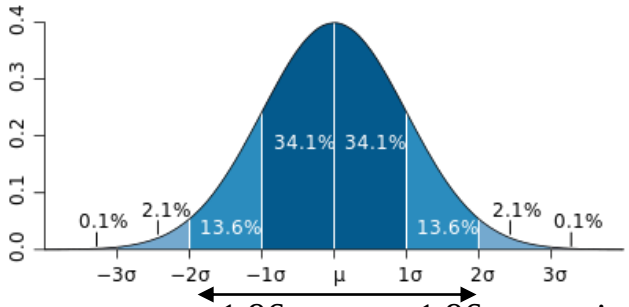
- **Estimation methods**
  - find best possible estimates of value, preferably from a sample
  - measures uncertainty of the estimate using standard deviation



μ - the estimate
ρ - the standard deviation

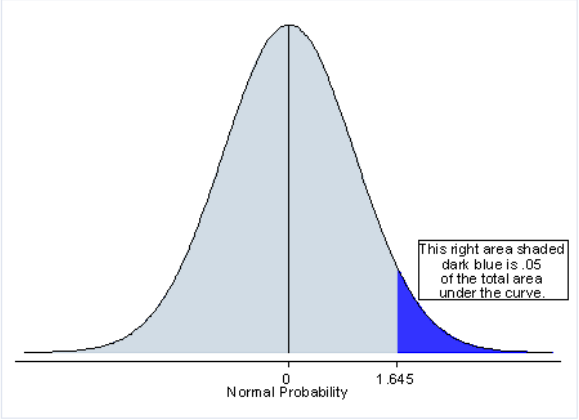
We estimate a value for a phenomena where the «true value» is not known (or cannot be known), hence the value we find is normally uncertain.
If a value is measured to μ, we are

- 68,2% sure that the "true value" lies between μ-ρ and μ+ρ. We then say that we have a confidence interval of 68,2% that the true value is in the interval μ-ρ and μ+ρ.
- 95,4% sure that the "true value" lies between μ-2ρ and μ+2ρ
- In many situations, one demand 95% level, which correspond to the confidence interval μ-1,96ρ and μ+1,96ρ



μ-1,96ρ μ+1,96ρ gives a 95% confidence level.

- Of course, μ and ρ varies for different experiments.
- NB! Sometimes it is correct to make a one-sided test. If so, the limits are different.

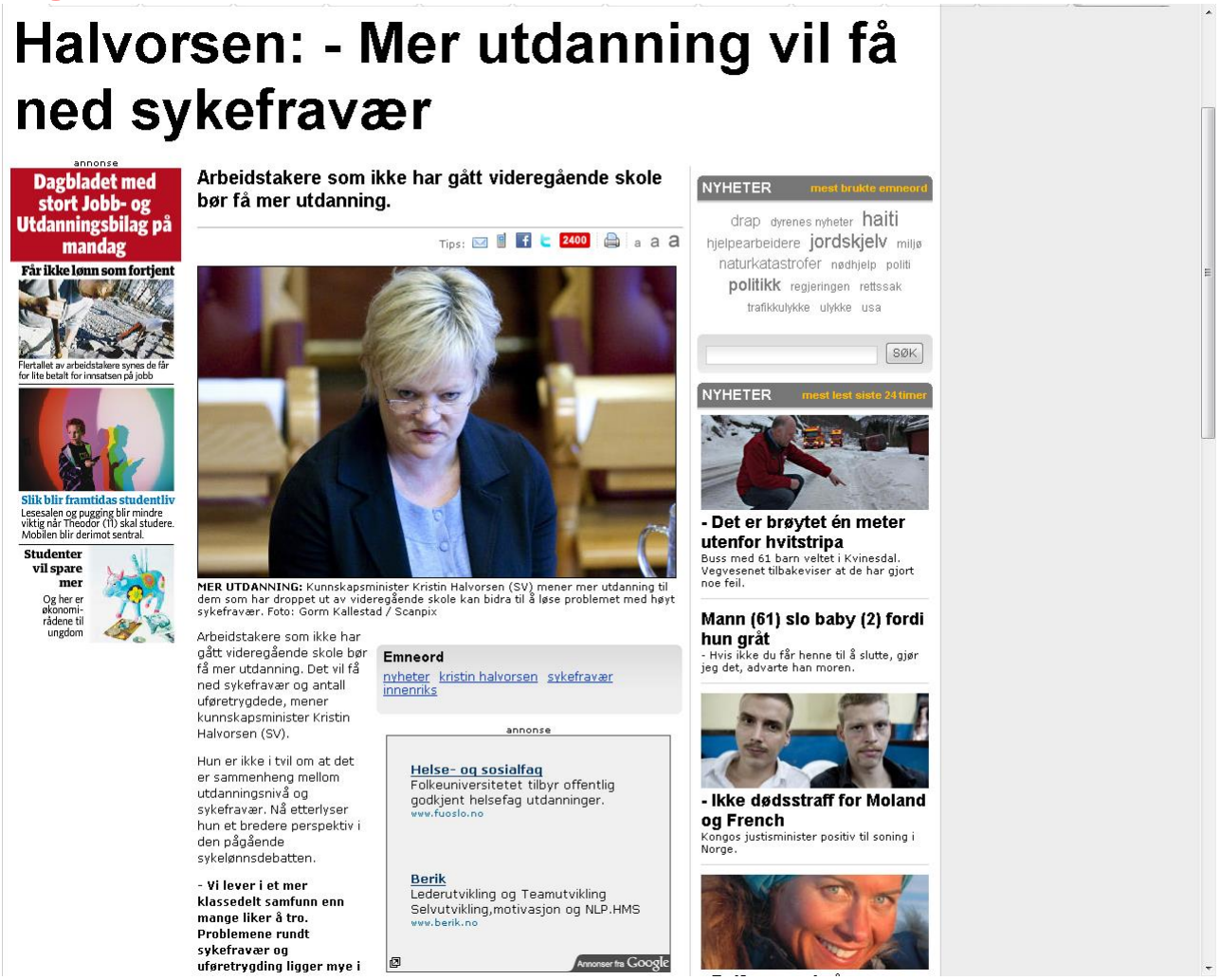


. Quantitative methods, VII.

Measurements on the web is highly uncertain!

Causation?

Quantitative methods, VIII.



Quantitative methods, IX.

It depends on the perspective .....

brukervennlighet.

8. Ikea RENLIG DWTI60 (5000 kroner)

Foto: ICRT/Forbrukerrådet

Ikea RENLIG DWTI60 vasker renest av samtlige maskiner i denne testen. Den setter minst vannmerker. Det gode vaskeresultatet kan sannsynligvis forklares med at den bruker mest vann og strøm på hovedprogrammet av samtlige testede maskiner, noe som i denne testen gir så kraftig trekk at maskinen likevel havner på bunn. Den er i tillegg testens billigste maskin, selv om pris ikke påvirker bedømmingen.

Qualitative methods, I

Observation and fieldwork

- find typical "field" to study (or, if you want to see the special fe lt?)
- assess **the degree of their participation**

hidden open participating action research

Participant: Is it ethical to participate under "false flag"?
An example: admit themselves as mentally ill to study behavior in a psychiatric hospital. Better: stay long enough in the environment until one forget that you are an observer.

"In every village in Africa there are three kinds of people:
- children
- village's older residents
- social anthropologists "

Zoo Visit paradox:
"Is that really we who study monkeys, or maybe it's monkeys who study us?"

- find the informants that are interesting (Harald Endrerud: 80-20 rule works here too: 20% of interviewees gives the 80% most interesting information). However, may give skewed ("biased") response.
- registration: voice recording, field notes (or. running notes on the right side, professional and methological comments on the left side), try to remember (memorize or note keywords, makeing drawing of the environment can help you remember)
- do not put your own values or status as a basis for observations
- notes what is happening, not make judgments (not "the person acted as an authoritarian" - it is in case a part of the analysis)
- be aware of the role of the researcher, including not over- or underidentify

Discussion: you may want to have multiple observers?

Qualitative methods II

Qualitative interviews

- degree of structuring

completely structured interview guide completely unstructured

- quotation method: continuous notes or recording (exactly, but some are restrained by it and you lose non-verbal signals)
- listen, ask again to clarify, not to pull it in the "desired" direction
- can pay off with coffee / tea breaks, it can provide valuable information in itself, and can make part two of the interview easier.
- give encouragement to make additional statements
- "Revolver" questions can give honest answers and good information, but must be used with caution
- retrospective interviews (ie dealing with the past): what it is may have have memory offsets and be "done adultwise"
- group interviews can provide good conversation, so that the interview situation is forgotten and you get more honest answers, but it can also bind some of the participants, and some may be "overrun".
- Focus groups
- More informal: world cafée

Discussion: what pulls in either direction in the figure above?

Qualitative methods, III

Document analysis and source criticism

two main types of use:

- comparison with previous studies in the preparatory stage in a research program
- use of documents as source material (a la informants).

Use of documents as source material

- can be primary sources or secondary sources (from others who have described or analyzed this - must in case used with care).
- Examples of document types
  - historical documents
  - contemporary documents, for example reports or minutes
  - different laws, agreements, other documents
  - textbooks
  - previous studies may be the primary material itself.
- can be combined with interviews or observations (eg. comparison between organizational structure, physical office design and the company's decision process - the latter via documents).
- Method
  - draw time comparisons
  - draw comparative comparisons (example: comparison of legislation in a field in different countries)
  - often discursive, can still reach clear conclusions
  - advantage compared to observations and qualitative interviews: the analysis (and to some extent the conclusion) is verifiable.
- analysis of individual documents to "find meaning in them" leaning more towards hermeneutical method (here are several, sometimes conflicting "schools"). Some subjects (parts of philosophy, theology, language, pedagogics, history etc.) often hermeneutical approaches.

Qualitative methods, IV

Analysis, interpretation and report writing.

- No analysis is without conditions, but qualitative studies are more vulnerable.
- Try connecting it to existing theory or **"hunt for the good typology"**
- Feel free to use simple statements such as parts of argumentation and report, but be careful with too much quotes. Ditches are:

narrativism - only retelling

over-interpretation – of individual statements

- The report should often connected to existing theory, but also provide breaking-the-**border-recognition.**
- A possible systematization form part of an investigation:

Data Matrix with:

	Age	Position	Opinion on ...	Observation of ...
Hansen	....	....	... ..	....
Jensen	....	....	....	....

- Be aware of **the danger of self-related explanation formation:**
  - sociologist interpreting observations as a social problem,
  - Psychologists as a psychological problem etc..

The "hammer effect":
"If you give a child a hammer, then it is very much to be hammered."

- It is important to specify and, if necessary, discuss, the rationale for the conclusions drawn.
- Be aware of what is normal cases and what cases are special cases, and describe / categorize accordingly.
- A graphical description of causality, cf. Quantitative methods are equally applicable here.

Qualitative methods, V

Qualitative evaluation methods

- Much of the same methodology, incl. Written reports may be used in the evaluation ("linking values to the findings"), for example in business.
- Can use qualitative and / or quantitative methods.
- In some cases benefit of internal, in some cases external (external consultancy). The last one costs more, but they may observe things that are not seen by the internals, they may have similar experiences, and dare to say unpopular things.
- Process orientation vs. product orientation.
- May be asked whether there is mostly research or mostly "business".

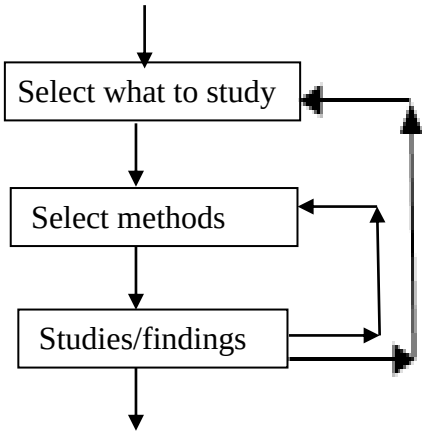
Multimethodology, mixed methods

Instead of sticking to quantitative or qualitative methods only, one often apply a mixture of many methodologies.

- Supports a more holistic worldview, many phenomena are not understandable as "quantitative only" or "qualitative only", → fitting methods to the phenomena and the different aspects you want to emphasize.

- Mixing
  - Quantitative and qualitative data
  - Methods (but often mainly using one of the above)
  - Paradigms
  - Aspects/perspectives

- Often, the (initial) findings leads you to new problems to study, hence you must redefine which methods/mix to use.



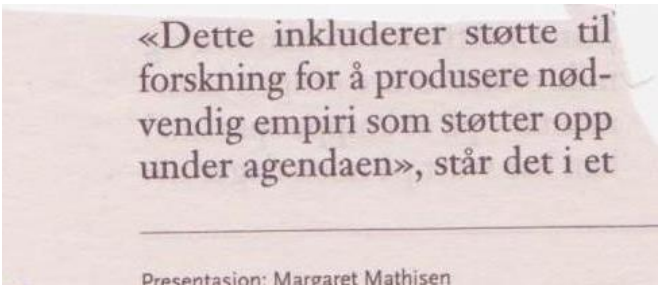
- Using a mixed method approach makes it even more important to discuss and argue why the "method mix" used is relevant.

Important note:
saying that "I use a mixed mode research" must not be an excuse for not using any method at all!

Research used in political and commercial arguments

Research aims (at least should aim) to reveal the truth / certain knowledge, it is used in a variety of contexts to convince others. That's why it can be strategically wise to use it in the argument. Some examples:

- Notice how politicians often say that “research shows ... ..”
- Meanwhile, others often respond that "No, according to research, it is actually the opposite ... ..»
- So: research must be evaluated critically, but they will not fit in an argument - thus it becomes easy used as a rhetorical ploy.
- Unfortunately, it is also used to win the produce "biased" information:



(written in a secret policy document, taken from a newspaper, in an inflamed political debate)

- "Research shows that the product x provides 20% more effective than product y".
- Worse: "Research shows that the product x affects up to 75% better ... ..»

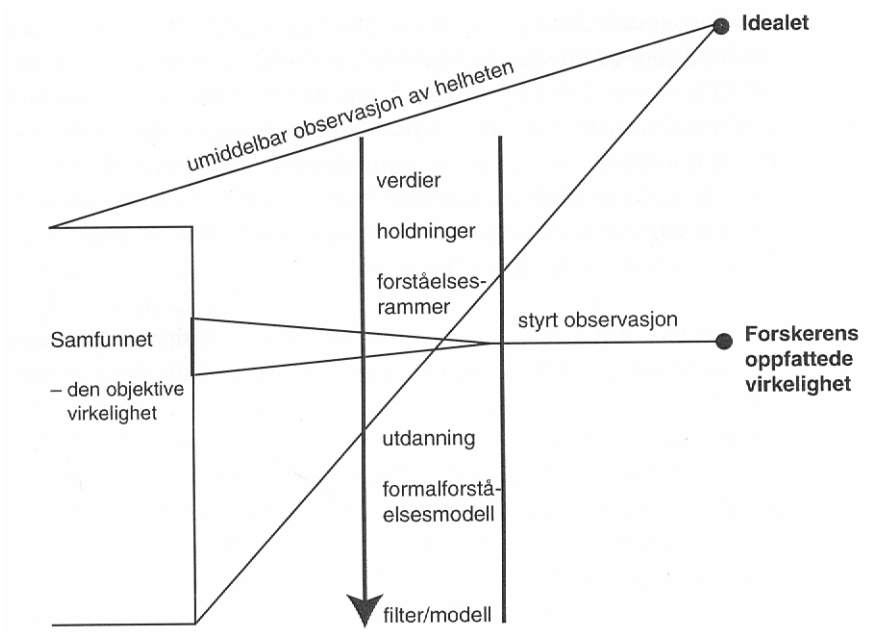
There are three kinds of lies:
Lies, damned lies and statistics

Benjamin Disraeli ? Mark Twain?

The question is "when is it ethical to use research as part of an argument"

Can we trust the results?, I

Ideal and reality in social science research



Figur 4.1 *Den umiddelbare, ustyrte observasjonen er uoppnåelig*

(From Holme and Solvang: Choice of methods and methodology)

- Honest admission of this is better than to believe that one can be completely objective
- It is becoming more and more accepted that the researcher explains his own position / background
- Still, we want to reduce these variables where possible
- In particular, qualitative methods may be vulnerable - cf. also a well-known book in research methods - titled "Between the proximity and distance".

Discussion: Can you find good examples on the difference between ideal and reality?

Can we trust the results?, II

Categorization of correspondence between ideal and reality: reliability and validity

Reliability

- Measures how good we are able to measure the values we want to measure
- A common definition:
  True value = measured value + random error + systematic errors
- The aim is, needless to say, making the last two ones as small as possible, and there are techniques to help with this.
- Traditionally most appropriate to quantitative methods.

Validity

Several categories of validity. A common categorization:

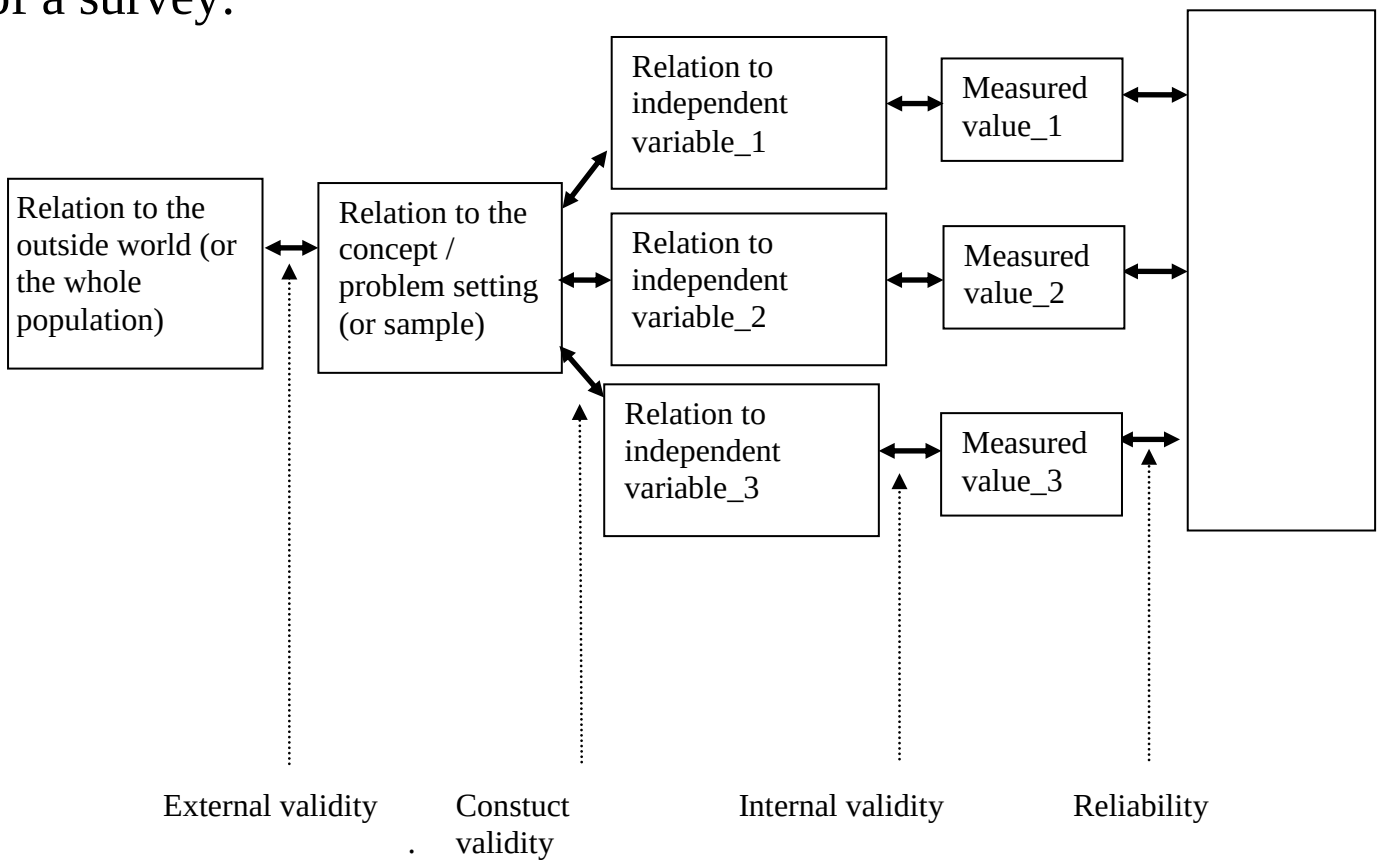
- **Construct validity:**
  To what extent is there consistency between the concept(s) measured and operationalized variables?

- **Internal validity:**
  To what extent can we draw conclusions on the relationship between the independent and dependent variable?

- **External validity:**
  To what extent can the findings be generalized, for example, from the survey sample to a larger population.

Can we trust the results ?, III

Relationship between validity, reliability and various parts of a survey:



Can we trust (really) the results ?, V

The question is largely philosophical:

- are they "true" only given certain axioms? paradims?
- we have built up a system and framework in which seems be consistent ("non-contradictory")
  but:
  - there may be several such non-contradictory framework, including many that we have not detected?
  - there are, apparently at least, contradictions, also in mathematics and physics.
  - in statistical surveys, it is important to be aware of the uncertainty in the results.
- it is also important to be critical both to the findings and the methodological framework that is designed
  - are they primarily expressions of the elite's view of reality?
  - critical theory ("critical inquiry") orientation is trying to form a science been built on the critique of the current paradigms mm (Jürgen Habermas and others)

So the real answer is that we cannot know for sure if we know what we know. Finally, it is therefore a matter to assume / believe that we can rely on these in most cases

- **at least from a subjective experience/feeling of intersubjectivity[1]**
- **or subjectively experienced sense of an objective truth**

It is also important to ask about the limits of science. Is it true that all reality is captured by science? What about art, religion, sports, pleasure, politics, love. .. If you analyze these phenomena scientifically and think this is the whole truth, you risk losing the whole point of them ...

- **Science can only say something about what can be known by the scientific method - and perhaps barely enough there.**

[1] But, if so, the claim that there is no objective truth must surely be an objective truth!

Prepare for a 5 – 8 minutes on one of:

- “Mixed methods” – what and how?
- “How can you obtain secure knowledge” (if at all)
- Statistical functions in a spreadsheet, 2-4 examples. One may be average, the others should be more advanced
- Learning theories, at least behaviorism, constructivism, social learning theory.
- Data – information – knowledge – wisdom
- Knowledge: individual, shared, globally available. Consequences for organizations?
- Does a computer learn, know, think, understand?
- Double-blind studies: what is it? one example please!

- In an introductionary course in programming at UiO, the students were divided into two groups
  the first got very much help in their studies (TAs etc)
  the latter got parsimonious help
  The last one obtained better results. Explain why.
  a) if the students were able to choose groups themselves
  b) if they were randomly chosen.

- At the Norwegian-Swedish border at, there has been more smuggling into Norway than previous years, in spite of more controls.
  Comment upon this!

- When Edgar & family moved from Bærum ("upper class" community near Oslo) to Fredrikstad, it led to a higher average IQ in both communities (!).