

Week 3: Qualitative and mixed method research

Short introduction to qualitative research

Let's refresh our memory of Prof. Sajaniemi's nicely summarized differences between qualitative and quantitative research.

http://www.cs.joensuu.fi/~saja/sci_met/lectures/chap_intro_sci_res.html

Similar comparison can also be found in the net

<http://wilderdom.com/research/QualitativeVersusQuantitativeResearch.html>

Regardless of what research approach you are using, a **general research cycle/spiral** can be identified (Holz et al. 2006; Nunamaker et al. (1991). Figure 1 presents general phases of a research cycle process.

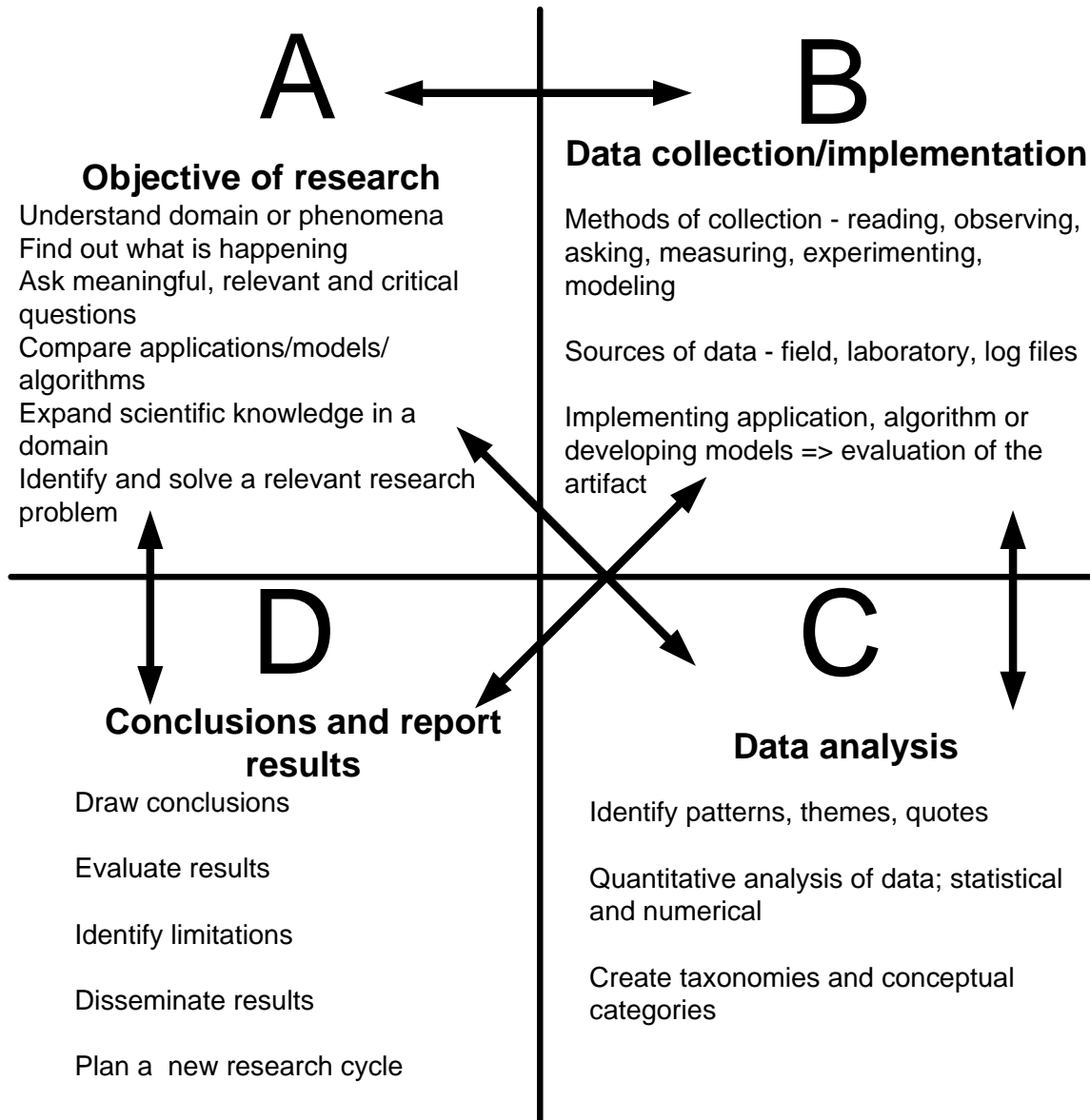


Figure 1: Research process

Note: the phases presented above are often interlinked and synchronous. Also the research process (e.g. how the phases are related to each other) naturally varies in different research situations.

In Figure 1, deVilliers (2006) has presented how different research methods are related to the positivist and interpretive research paradigms.

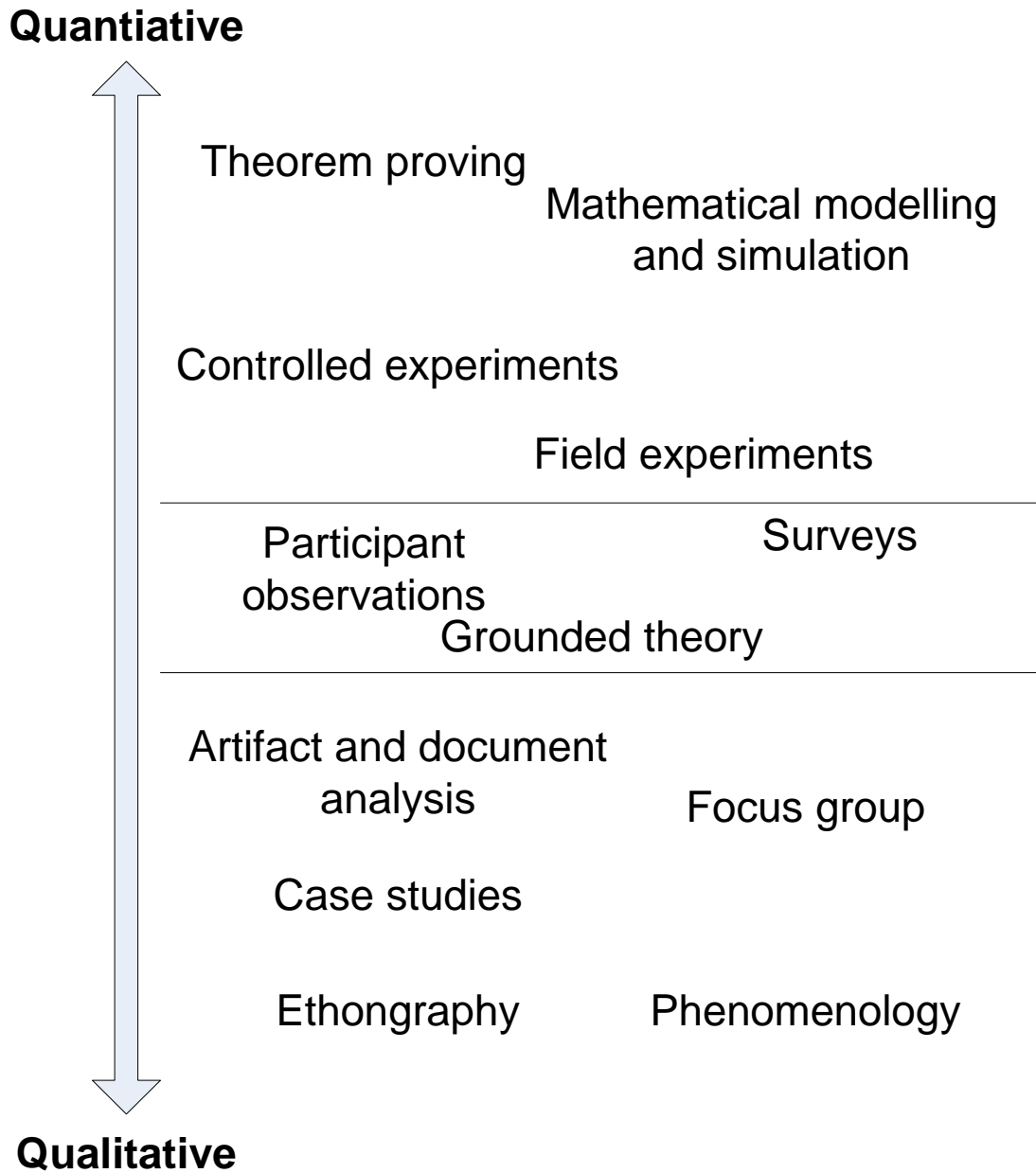


Figure 1: Quantitative and qualitative research methods (deVilliers, 2006)

Philosophical perspectives behind qualitative inquiry

The following philosophical perspectives can be identified behind qualitative inquiry. Please note that not all qualitative researchers share the same philosophical view.

- scientific knowledge **can be** time- and context dependent and research settings are an important part of the research (Barab and Squire, 2004)
- the scientific method of qualitative tradition is often **inductive** – the researcher generates new hypothesis and builds up the theory from the collected data. **Conceptual categories** are created from the data and the researcher moves back and forth between the categories and observations to refine the research results
- inquiry can lead **to subjective findings** which may differ between researchers => appropriate for studies of complex human behavior, shared meanings and social phenomena
- understanding is achieved when researchers place themselves **into the study context** (Flyvbjerg, 2004)

Aims of qualitative research

Depending on the research tradition and field, various aims for qualitative research can be identified

- to understand the world from the **point of view of the research participants**
- to interpret the **experiences and meanings of people** in complex settings (Greening, 1997; Mayers and Walsham, 1998).
- to discover themes, knowledge, and relationships (Berglund et al., 2006)
- to explicate the ways people in particular settings come to **understand, account for, take action, and otherwise manage** their day-to-day situations (Miles and Huberman, 1994)

Characteristics of qualitative research

Although single qualitative research methods differ from each other, one can still identify common characteristics

- the main research questions are “how” and “why” questions
- research is conducted usually in **naturalistic settings** rather than in laboratory settings (Cohen et al., 2000); research is rooted deep into the research context
- triangulation: collection of extensive, descriptive data from many sources (Hashway, 2002; Cohen et al., 2000) => typical data collection methods are interviews, observations, case studies, survey and historical or document analysis (Savenye and Robinson, 2001)
- research participants are often selected **purposefully**, not randomly. A study of single cases compared to the study of whole population or samples of the population
- the studies involve thick and deep description of **research settings and data**, e.g. behavior of people, communication protocols, opinions and feelings (Miles and Huberman, 1994)
- details of the **individual cases** can give readers of the research report understanding of the investigated phenomena
- the researcher can get immersed in the targeted research area to make **first-hand observations of research activities**, sometimes even engaging personally in those activities as a “participant observer”

When to use qualitative methods

- concept needs to be understood because of the little previous research efforts (Johnson and Christensen, 2007)
- there is not existing knowledge about the important variables or the phenomena under study cannot be reduced to numerical variables
- need for innovation and researcher-designed frameworks
- research needs to be conducted in settings where quantitative approaches can not be applied, e.g. real life environments, situations and processes (Hazan, n.d.)

- falsification of a theory, e.g. if one case do not confirm the claims of the theory, the theory needs to be rejected or modified

Data sampling

The research data in qualitative research is often extensive, which requires that the data under investigation needs to be narrowed down. Various **data sampling approaches** can be applied to focus the analysed data.

Gobo (2004) and Miles and Huberman (1994) identify the following main strategies for data sampling in qualitative research

- 1) purposive sampling; detecting cases within **extreme situations** or cases within a wide range of situations in order to maximize **variation**. Example: selecting both highly unusual and typical cases, or cases that confirm and disconfirm theory.
- 2) snowball; picking some subjects who feature the necessary characteristics and through their recommendations find other subjects
- 3) theory based and criterion based; all cases the meet a predefined criterion or fit into the theory
- 4) random sampling
- 5) combination of the above sampling methods; triangulation and mixed

Data analysis processes

After the data has been collected using some sampling approach, it is analysed in order to identify the relevant information. According to Miles and Huberman (1994), data analysis process in qualitative research consist of the following interwoven and cyclical phases.

- 1) data reduction. The research data is organized and classified into major themes, categories and/or case example. The typical data processing methods are: **selection, summary, focus, simplify, abstraction, paraphrase and transformation**.
- 2) data display. The reduced data is presented in a form of tables, matrices, graphs, charts and networks to support the interpretation process.
- 3) draw conclusion. The researcher makes conclusions and provides answers to the research questions.

Since the data is usually extensive, qualitative data is often processed with software tools, such as ATLAS/ti, The Ethnograph, NUD*IST, Qualrus, HyperResearch.

Criticism towards qualitative research

- do not follow the principles of classical science, e.g. objectivity, replicability, generalizability and metrics of validity (Anfara et al., 2002)
- subjective biases
- lack of causal reasoning

Validity and reliability of qualitative research

Validity is used to express the degree of trust towards the claimed research results. Compared to quantitative research, qualitative research has different measures for validity (Johnson and Christensen, 2007).

- whether the research results are repeatable and conclusions sensible (Joy et al., n.d)
- whether the researcher is able to accurately portray the meaning given by the participants
- whether the observed relationship is causal
- whether the researcher is able to generalize the research results beyond the immediate research context

In qualitative research, the researcher is expected to critically self-reflect validity of his/her research results. The following measurements are used in qualitative research to determine the degree of validity

- honesty of the researcher, e.g. reflective inquiry
- depth and richness of the data
- scope of the data achieved
- extend of triangulation
- tendency towards objectiveness of the researcher

Reliability is used to evaluate the **stability of observations** (Miles and Huberman (1994)). In qualitative research report, it is important to evaluate whether the researcher would have made the similar observations and interpretations if they had been observer in different time or in a different place. Another aspect of reliability is to judge whether the researcher would have made the same interpretations if she had paid attention to other phenomena. According

to Joy et al. (n.d) when the research settings are rapidly changing, it might not be possible to replicate a study. Reliability of qualitative research results can be improved by using two researchers to categorize the same data. In this case, **inter-rater reliability** is used to evaluate whether the two researcher have made similar observations.

The validity and reliability of qualitative data is dependent on the methodological skill, sensitivity and training of the researcher(s). It is also important to make the research process **transparent**, e.g. details of the data collection, exact description of the sampling criteria and criteria for categorization (why certain piece of data belongs to a certain category). The researcher should also be aware of the following critical aspects when analyzing qualitative data (Miles and Huberman, 1994)

- holistic fallacy; events are interpreted to be more patterned and congruent that they really are
- elite bias; the data is overweighed with high-status informants or underpresenting data from low status informants
- going positive; being too much fascinated from the perceptions and explanations of local informants

Examples of qualitative research in Computer Science

1) Computing Education Research (CER)

Berglund et al. (2006) present present following concrete types and examples of qualitative research in Computing Education Research.

- Study of learning settings and communities
 - Holland and Reeves study of group work for **students' teams working with software development**. Findings: the teams took different perspectives to the object of the work, the importance they gave to sub-tasks and how they carried out the development process
 - Chew, Beaumont, Seah and Westhead study **students' actions in distributed teams** in a computing course. The focus was on how student select their tools for communication, how conflicts in the use of communication tools have arisen and how students overcame the conflict
 - Ben-David Kolikant study the clash **between the cultures of academics and users**. The main results from the study are that the

studying environment should create an opportunity for the students and academics to identify and cross the cultural boundary.

- Ben-Ari argues that teachers of computing **should study the communities of practice of professional computer scientists** and design educational activities which model the activities of those communities.

According to Beglund et al. (2006), the above examples present how qualitative research can go beyond the question of **how students learn** about a specific concept. The qualitative approach invites the researcher to study the complex settings that arises when students interact in studying environment.

➤ Phenomenology

- explore a phenomenon **from students' perspective and reveal qualitatively different ways** in which the phenomenon can be experienced, understood or perceived
- study **learning of computing concepts**; computer networking protocols, programming, the concepts of objects and class, concepts of information systems
- explore **students' objectives** in the studies

➤ Constructivist

- how students **themselves construct models** of what they learn. For example, studies have shown that student invent their own models of learning domain and that there are **differences between** language spoken by students and that used by teachers and in books. The argument is that teachers should be aware of these differences, so that they can aim to narrow the gap. Teaching should be organized in a way that the students' are able to see different aspects of the phenomena taught.

2) study the human aspects of a software development process, such as customers, software development cultural and teamwork. According to Hazan (n.d.) the added value of such an approach is that the practitioners' voice is heard and, based on the results, guidelines for the assimilation of the new software development method are outlined.

Recommended literature in qualitative research

Recommended literature for qualitative research methods include (please note that many of the books about qualitative research are from social sciences and humanistic fields)

- Creswell, J.W. (2007). *Qualitative inquiry & research design: Choosing among five approaches* (2nd. Edition). Thousand Oaks, CA: Sage.
- Johnson, R. & Christensen, L. (2004). *Educational research: Quantitative, qualitative and mixed approaches*. Boston: Allyn & Bacon.
- Miles, M.B., Huberman, A.M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.
- Sale, C., Gobo, G., Gudrium, F., Silverman D. (2004) (Eds.). *Qualitative Research Practice*. Sage Publications.
- Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage.

Net links

- Boree, C.G. (n.d.) *The Qualitative Methods Workbook*. Retrieved September 18, 2009 from
- Mayers, M.D. (n.d.). *Qualitative Research in Information Systems*. Retrieved September 18, 2009 from <http://www.qual.auckland.ac.nz/>
- *The Qualitative Report Journal*, <http://www.nova.edu/ssss/QR/index.html>
- Wikipedia; http://en.wikipedia.org/wiki/Qualitative_research

Mixed method research

In the *mixed method approaches*, the researcher uses different types of research methods, even from different paradigms. The aim is not to replace quantitative or qualitative research, but to use the strengths and compensate weaknesses of single research methods by combining variety of approaches.

Strengths of mixed method research

- overcome the weaknesses of a single method study (Randolph, 2007). For example, provide a perspective that might have been missed by using just one research method
- get a holistic picture of the phenomenon
- numbers can be use to add precision to words and narrative
- words and picture can be used to add meaning to numbers
- can provide stronger evidence

The popularity of mixed research approaches has increase in recent years. For instance Randolph has investigated the proportion of types of articles in educational technology journals 2000-2005 and his findings show that researchers tend to do the same proportions of quantitative, qualitative and mixed method research (Randolph, 2007, p. 65).

Example of using mixed methods;

1) qualitative study might be used to create a theory about a phenomena and identify the important variables, which experimental research would be used to test the theory.

2) qualitative research could complement experimental research to confirm research findings when examined in detail (Randolph. 2007).

3) empirical methods could be used to observe a behavior while interviews could be used to investigate the intentions of people behind the behavior.

Example presented by Dubensky and Hassan (2005),

"One option for such a combination is **to start with a qualitative research work**, trying to identify the important observations as they are revealed by the participants in the research field. Then, based on the findings of the first stage, **several hypotheses are tested in a quantitative manner** and then, based on the findings of the second phase, a second **qualitative research phase is performed, that aims at explaining** those quantitative findings."

Examples of mixed method research in Computer Science

Berglund et al. (2006), provide the following examples of mixed method research in the field of CER.

1) formative evaluation of distance learning program with quantitative and qualitative methods (Torvinen, 2004). Quantitative methods are used to analyze logs and examination rates, while qualitative techniques are applied to offer insight in trends and tendencies

2) studying learning of programming in PBL-course in order to distinguish between efficient and inefficient working groups. The focus: interaction of the groups.

Dubinsky and Hassan (2005), present an example of using qualitative research in studying agile development methods

- results and development process of traditional and agile teams were examined and compared with quantitative approaches
- qualitative methods were used to understand the agile development process from the system analysts and designers' point of view (practitioners)

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