Capabilities for "Theory Building" and "Hypothesis Testing" in Software for Computer-aided Qualitative Data Analysis

Udo Kelle

(2016 words)

Introduction

Qualitative researchers who work with large amounts of unstructured textual data, like interviews, field protocols or personal documents, regularly face serious data management problems which cannot easily be solved by the use of standard database systems. Although such programs can be used to fulfil one of the central tasks of qualitative data management, the retrieval of relevant segments of text, they nevertheless impose serious limitations. They require that text segments and coding schemes are defined before the data are entered which contravenes the inductive categorisation strategy preferred by most qualitative researchers.

Since the mid-eighties a variety of *non-formatted textual database systems* have been developed for qualitative research. Programs like THE ETHNOGRAPH, HYPERQUAL, WINMAX, ATLAS/TI, NUD•IST, KWALITAN or HYPERRESEARCH all use similar data structures to assist the organisation and management of textual data: the addresses (e.g. in terms of line numbers) of text segments (which the researcher can define freely) are stored as pointers together with the names of the codes allocated to these segments. With this software unstructured textual material can be organised by attaching codes to certain text passages. Retrieval algorithms then help to find and retrieve those text segments to which certain codes were assigned.

"Computer-aided qualitative data analysis software" (CAQDAS) is now widely applied in the qualitative community. The first generation of "code-and-retrieve programs" only mechanised widely used cut-and-paste or indexing techniques but did not change their underlying logic or offer analytic features which could not be employed using manual methods. This situation changed as more and more complex coding and retrieval facilities were added to these programs which were promoted by their developers as a means of qualitative "theory building" and "hypothesis testing" (see KELLE 1995, 12f; RICHARDS, RICHARDS 1994: 447f.). In this article some of the methodological problems connected with the proposed

strategies of qualitative "theory building" and "hypothesis testing" will be addressed.

Facilities for Enhanced Coding and Retrieval

The first code-and-retrieve programs linked codes to text segments by using pointers. Similar data structures can be used to define linkages between codes themselves. Since theoretical categories can be more or less closely related to the codes used to organise the data material, the idea emerged that the structure of a theory developed in a qualitative project could be represented through a "network" of codes (Kelle 1995: 62f.). Some code-and-retrieve programs, e.g. NUD•IST, Hypersoft or ATLAS/ti, nowadays contain extensive features which support the construction of networks of code categories.

These enhanced coding facilities (which are seen as instruments of "theory building") are usually supplemented by complex retrieval functions, which are regarded as instruments of "theory testing" or "hypothesis testing" (see HESSE-BIBER, DUPUIS 1995; HUBER 1995; RICHARDS, RICHARDS 1994: 447f.). These functions can retrieve information on whether certain codes co-occur in the text. For example, a researcher who has coded the data with codes for "critical life events" (CLE) and "emotional disturbances" may now examine the hypothesis that critical life events are always or frequently accompanied by emotional disturbances. The hypothesis can transformed into the following query about all co-occurrences of text segments coded as "critical life event" with segments coded as "emotional disturbances":

> **SEARCH FOR** incidents of critical life event (CLE)
> **AND** emotional disturbances (EMO) within a
> **MAXIMUM DISTANCE** of 10 lines.

In this way the co-occurrence of codes in a certain document is intended to indicate the presence of critical evidence for or against a hypothesis.

The methodological background of enhanced coding and retrieval facilities

At present, qualitative researchers   seem to be reluctant to fully exploit the new possibilities offered by complex coding and retrieval, as investigations among users of CAQDAS show (cf. LEE and FIELDING 1995). As this was also the case with the first CAQDAS-programs in the mid-1980s, it is not yet clear whether this caution is due to serious methodological problems or to a certain technological conservatism.

To address this question it may be helpful to consider the role of "theories", "categories" and "hypotheses" in the research process. Following the standard textbook view, a theory is (or, at least, should be) *a set of logically interrelated propositions*, from which one (or more) hypotheses can be deduced. "Hypotheses" are empirically contentful (=falsifiable) statements about the relations between certain categories. To test a hypothesis means to apply an exact rule which leads to a decision on whether the hypothesis can be accepted or rejected. There are essential methodological prerequisites for applying such rules: in the above example it is of utmost importance that it is possible to decide whether a given observed event is a case of "CLE" or "EMO" or not. Consequently, the concepts or categories used in the hypothesis must be *mutually exclusive*: that means, it must be possible to decide whether a certain event is "critical" or "non-critical", and whether a given person is "emotionally disturbed" or "not disturbed". In other words, codes must represent clearly defined empirical events.

Let us now turn to the kind of "categorising" or "coding" applied in qualitative research. Normally this process starts by tentatively identify major perspectives the researcher wants to present and the areas to which these perspectives apply. Thereafter, each incident in the data is marked with a code that stand for the various areas to which it appears to be relevant. Codes could either be "theoretical codes" (GLASER 1978), that is highly abstract concepts like "*interaction*" or "*identity*" drawn from "*grand theories*". A code scheme developed from such abstract theoretical concepts has been called a *coding paradigm* (STRAUSS, CORBIN 1990, p. 99ff.) which plays the role of a theoretical axis or a "skeleton" to which the "flesh" of empirical information is added from textual material. Or codes could be drawn from the stock of common

sense knowledge of the members of   the investigated social world ("*in vivo codes*", GLASER 1978, p.70)

Both kinds of code categories are either rather trivial or highly abstract and thus have something in common: they cannot be used to construct empirical propositions without additional information about empirical facts. This makes them rather useless for traditional "hypothesis testing". Unlike in hypothetico-deductive research the categorising of text in qualitative analysis does not serve to condense relevant information and to decide whether a certain person or event falls under a certain class of events or persons. Instead, the code categories described above are used as a heuristic tool for theory building. The function of categorising is restricted to sign-posting: codes are stored together with the "address" of a certain text passage and, drawing on this information, the researcher can locate all the possible information provided by the textual data on the relevant topic. This is a necessary prerequisite for the process of a systematic comparison of text passages which is the basis of the kind of "hypothesis examination" employed in qualitative research.

Qualitative hypotheses, when they first come into a researcher's mind, are usually not highly specified and definite propositions about certain facts, but tentative and imprecise, sometimes very vague conjectures about possible relationships. Following the philosopher Hanson, rather than calling them hypotheses one should call them hypotheses about what *kind* of propositions, descriptions or explanations will be useful in further analysis. They are insights that "*whatever specific claim the successful H(ypothesis) will make, it will nonetheless be an hypothesis of one kind rather than another.*" (HANSON 1971: 291)

Researchers investigating gender-specific occupational careers may, for example, develop the orientation hypothesis or heuristic idea that there must be a relationship between their interviewees´ orientations towards work and family. They may then retrieve all text segments from their interviews coded with codes referring to both "work orientation" and "family orientation". The notion of hypothesis testing would be rather misleading here, if one understands it as an attempt to falsify an empirically contentful statement. But a heuristic idea can lead to the development of falsifiable statements, for example if one finds that the

interviewees with specific work   orientations also show specific orientations towards the family.

Consequently, new strategies for complex retrieval contained in CAQDAS-packages can be applied in two totally different ways:

The search for co-occurring codes could be used as a *heuristic device:* the objective is to retrieve the original text to which the co-occurring codes had been attached. Then the researcher investigates the meaning of a certain co-occurrence by a thorough analysis of the original text. The interpretative analysis of interview texts forms the basis for the clarification and modification of the researchers' initial (general or vague) assumptions.

Alternatively, the mere fact of co-occurrence is itself regarded as evidence or counter-evidence for a certain hypothesis: Researchers may then formulate their hypotheses in the form of a series of "if/then"-statements of the kind "If code A AND code B AND code C are present in a certain document or text segment, THEN the hypothesis has to be accepted." Here, the primary goal is not to retrieve text but to use the information represented by the codes themselves as a basis for decision making. Similar to statistical significance testing, the decision making process is strictly rule governed. However, as should be clear by now, there are certain methodological requirements and limitations to such a strategy:

1. The prerequisite of *independent testing* requires that a hypothesis is not tested with the same empirical material from which it is developed.

2. The hypotheses must be empirically testable, that means they must be precise enough and have empirical content.

3. The codes which are used for hypothesis testing must denote clearly defined phenomena in a reliable and stable way.

The last prerequisite will be particularly problematic in the context of an exploratory research strategy. If theory building is the main purpose of the textual analysis, the codes serve a heuristic purpose, and refer only in

a very general way to one of the   different areas or aspects of the investigated phenomenon. It is the text itself that interests the researcher, not the fact that text segments are coded with a certain code. S/he does not have empirically contentful hypotheses at hand, s/he wants to develop them from the material. If s/he is successful, empirically testable statements can be formulated and these statements can be tested. But, considering the discussion above, it is obvious that this stage of the analysis (the further testing of empirically grounded hypotheses) requires that new material is coded with a new coding scheme. However, now a research methodology different from exploratory and qualitative research is applied, which is quite well-known in the literature as "quantitative content analysis".

Facilities for enhanced coding and retrieval offer fascinating new possibilities for analysts to "play" with their data and thereby help to open up new perspectives and to stimulate new insights. But combining methodologies of theory building and of theory testing should not seduce us into simply "mixing" or even "confusing" them. By seeking to "test hypotheses" without having observed the necessary prerequisites, that is by applying strict rules to vague and "fuzzy" codes, one can easily produce artefacts.

References

Glaser, Barney G. (1978): Theoretical Sensitivity. Advances in the Methodology of Grounded Theory. Mill Valley: The Sociology Press.

Hanson, Norwood Russell (1971): The Idea of a Logic of Discovery. In: Toulmin, Stephen (Hg.): What I do not believe and other Essays. Dordrecht: Reidel, S.288-300.

Hesse-Biber, Sharlene; Dupuis, Paul (1995): Hypothesis Testing in Computer-aided Qualitative Research. In: Kelle, Udo (ed.): *Computer-Aided Qualitative Data Analysis. Theory, Methods and Practice.* London: Sage, p.129-135.

Huber, Günter L. (1995): Qualitative Hypothesis Examination and Theory Building. In: Kelle, Udo (ed.): *Computer-Aided Qualitative Data Analysis. Theory, Methods and Practice.* London: Sage, p.136-151

Kelle, Udo (1995) (ed.): *Computer- Aided Qualitative Data Analysis*. London: Sage Publications.

Lee, Raymond M.; Fielding, Nigel G. (1995): User Experiences of Qualitative Data Analysis Software, in U. Kelle (ed.): *Computer-Aided Qualitative Data Analysis*. London: Sage Publications. pp. 29-40.

Richards, Thomas J.; Richards, Lyn (1994): Using Computers in Qualitative Research: In: Denzin, Norman K.; Lincoln, Yvonna (eds.): Handbook of Qualitative Research. London: Sage, pp. 445-462.

Strauss, Anselm L; Corbin, Juliet (1990): *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Newbury Park, CA: Sage.