Qualitative Content Analysis and FMS Content Descriptors

Qualitative Content Analysis

Qualitative content analysis is a methodology used in the social sciences to systematically analyze and compare both the explicit and the implicit meanings of texts (Mayring 2000; Schreier 2012). It entails scrutinizing or "coding" a given text for the occurrence of a predefined set of topics. This set of topics consists of short descriptive phrases—what we call here "content descriptors"[1]— that represent various aspects of the complex content of the texts. Content descriptors are generated both inductively, from the research questions and hypotheses, and deductively, from the texts to be analyzed. Qualitative content analysis is useful for the analysis of fiction, as it allows one to work systematically with data that nevertheless requires a degree of interpretation (e.g. Schimank 2004). It is particularly helpful when exploring new territory, as in FMS, as it provides data collection that is guided but not limited by the research questions.

Projects 3b, 4b, and 4c will all be using qualitative content analysis, and collaborating in its development. The basic steps in the process, as adapted for FMS, are outlined here.

1. Content descriptors: The initial list of descriptors will be generated based on the following inputs: 1) the research questions in projects 3a, 4b, and 4c; 2) topics suggested by FMS team members based on their readings ; 3) topics suggested by Jennifer Rohn, based on eight years of monthly meetings of the Royal Institution of Great Britain's "Fiction Lab"; 4) previous analyses of science in cultural objects, including, among others, historical reconstructions of the cultural representations of science in literature (Haynes 1994), studies of science in popular films (Hüppauf/Weingart 2007, 2009), and Heide Lukosch's (2009) comparison of the ways science is presented in journalism and in popular films. These are sorted into categories, and then checked and further developed during coding of the first documents. Examples of FMS descriptors and categories are listed on page two of this Appendix.

2. Coding texts: The researcher reads a novel and notes all passages where a topic corresponding to a content descriptor is addressed. The length of the passage—the coding unit—may vary from a single word to several pages. Several content descriptors may be applied to a single coding unit. To increase the reliability and validity of coding, the first novels are coded independently by two researchers who then compare their results. Where the results differ, they formulate explicit rules on the application of the pertinent content descriptors. Throughout the coding process of new texts, descriptors can be added as needed.

3. Frequency of mention: A simple quantitative analysis of the coded text determines how often each of the content descriptors has been used. For example, how often are ethical dilemmas of science mentioned, and how often are the commercial potentials of scientific inventions mentioned? Documents can be compared with respect to their foci of attention. This allows the researcher to determine the foci of attention in a novel, which can then be compared with another novel, or with the foci of attention in a reading group or interview.

4. Qualitative analysis for all or the most frequent content descriptors: The researchers note *what* is said about a topic at each point in the coded text where a given content descriptor has been noted. These statements are typified, and a typology of statements for each content descriptor is generated. The occurrence and frequency of specific statements can be determined and compared.

5. Compare documents: The typologies of statements are integrated into a master typology that includes all types of statements for all the content descriptors. This allows one to compare the patterns and frequencies of statements about a given topic in different documents.

[1] Sociologists commonly refer to these as "codes," but the term "content descriptor" is more evocative and appropriate for use in the multidisciplinary context of FMS.

6. FMS Categories, guiding questions and content descriptors (*a preliminary list*)

The categories are the general foci of the analysis. The specific research questions that guide the analysis for each category are listed below. The terms in parenthesis are examples of just some of the content descriptors that we expect to gather from empirical studies, theory and, of course, the science novels.

Science as work (compared to other kinds of work, but also as a comparison between different scientific fields (for instance, biology/physics or natural sciences/humanities):

Where does scientific work take place? (e.g. in a institute, an office, a laboratory, outdoors, library, the industry, at home, etc.)? How is the workplace described? (e.g. modern/old, high-tech/obsolete, messy, unorganized, clean, meticulously ordered, chaotic, etc.)

What kind of work do scientists conduct? (e.g. theoretical, empirical work, teaching, tutoring, science communication, gathering financial resources, etc.) How is the mixture of creative work and routine elements, including red tape?

What are the differences between organizational contexts of work (universities, extra-university institutes, industrial laboratories, or military laboratories) with respect to research freedom/constrains, secrecy/openness, financial pressures/advantages, etc.)

What are the properties of work (e.g. solitary, interdisciplinary, a large-scale cooperation), and does it change? – for instance, from individual work to a large-scale cooperation?

What are the chances/constraints, advantages/disadvantages, and pressures/freedoms of scientific work: (e.g. time constraints, publication pressures, pressures to acquire third party funds?)

How is the social atmosphere of work (e.g. hierarchical, egalitarian, cooperative, collegial, competitive, etc.), and does it change?

What are the joys, and what are the horrors of scientific work? (e.g. autonomy, fascinating surprises, loneliness, failures)

Reasons for scientific success

Which factors contribute to the success of scientific work? (e.g. hard work, exceptional intelligence, serendipity, good planning, assertiveness etc.)

Character of scientific knowledge

What are the distinctive features of this knowledge, compared to other kinds of knowledge such as everyday knowledge, religious knowledge, etc.? Are there differences between scientific fields, and if so, which are they?

How does scientific knowledge relate to other kinds of knowledge? (e.g. do scientific questions or truths still provoke traditional or religious world views?)

How does the "esoteric" (i.e. inaccessible to the uninitiated) quality of scientific knowledge manifest itself (in language such as terminology or mathematics, in technical artifacts, or in scientists' "impression management" (the process of influencing the perception of others) etc.)?

What is the status of scientific knowledge? (trustworthy/untrustworthy, questionable/unquestionable, opaque/transparent, etc). Has the epistemological quality of scientific assertions changed?

How is scientific knowledge portrayed? (e.g. dangerous, socially beneficial, economically profitable, uncertain, risky, useless, unpractical, etc)

General characteristics of scientists: How are scientists depicted?

Which general features (age, gender, skin color, nationality, etc.) do they have?

What physical characteristics, skills and abilities are attributed to the character? How are scientists characterized? (e.g. name, academic title, health, clothing, accessories, tastes, hobbies, etc.)

How are their personality and character traits described (e.g. neuroticism, lack of social competences, career aspirations or altruism, meticulous, un/organized, absent-minded, thorough, rational/emotional, etc.)? Are they changing?

Social character of scientists

What other social roles do scientists have? (e.g. parent, sibling, spouse, friend, adversary, etc.)

What distinguishes female from male scientists? What are their respective roles, tasks and contributions? Do women face specific problems not shared by men (hidden gender bias, work/life balance)?

What are the motivations of a scientist to conduct scientific work? (e.g. intellectual curiosity, service to mankind, power, fame, getting rich, etc.).

How does the socialization of a scientist happen? Which are the stages of becoming a scientist from student to professor?

Is being a scientist becoming a job like many others, or is it still special – and in which respects? (compared to other kinds of important actors who shape contemporary society such as politicians, businessmen, organizational managers, journalists, artists, etc.).

Relations of science to other societal spheres – such as politics, the economy, media, religion, education, the military:

Where are the tensions between the scientific ethos and the inner-scientific agenda, on the one hand, and extra-scientific wants and considerations, on the other?

What are typical moral tensions or even dilemmas of science (e.g. experiments with humans or animals, protection of privacy)?

Is there an increasing instrumental use – and abuse – of science by politicians, industry, and the military, among others? What are instances of a loss of scientific independence?

Do scientists exploit other societal actors such as journalists or politicians for their own purposes?

Societal impact of science - with regard to hopes, on the one hand, and fears, on the other:

How does scientific knowledge contribute to society? (useful technological, advice to decision-makers, public appearances by scientists, academic training for occupations, etc.)

Which spheres of society are significantly influenced by scientific knowledge either directly or through technological innovations (e.g. industry), and are there still activities that are relatively untouched by science (e.g. religious beliefs)?

What is the relationship between (generally good) intentions, on the one hand, and unintended side-effects or long-term consequences? Who or what is responsible for such consequences and who or what is held accountable (government, individual scientists, scientific institutions, private industry). What causes the disjunction between intention and consequence?

To what degree does science generate utopian dreams and to what degree does it generate dystopian nightmares?

Do we control science, or is scientific progress getting out of control?

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