New Trends in Qualitative Computing

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6th Conference of European Sociological Association
Qualitative Methods
Murcia, Spain

ABSTRACT
The construction of theories by computer has been a long-standing objective of Artificial Intelligence research since the 1960's as well as an important task in qualitative research. Therefore, to understand the complex process of theory building is an essential topic to Qualitative Computing. Currently, a variety of qualitative data analysis programs are available that are proposed as an alternative to code-and-retrieve software, which had been addressed as 'third generation' software for qualitative analysis in the middle of the last decade. But now we are facing new trends in the design of programs, new trends in using these qualitative software, and new challenges, tasks and goals are emerging. In this paper the debate about the theoretical links between qualitative computing and qualitative methods is analyzed, focusing on the cognitive process involved in theory building. The new trends are discussed to highlight the role of conceptualization rather than description around the discussion on Grounded Theory Approach, then the debate about differences and similarities between Grounded Theory and Qualitative Data Analysis is the framework to the analysis.

New Trends in Qualitative Computing

- **Introduction: QC in Timeline; Third Generation and Computer's Metaphors**
  - 1) Theory Building & Computational Algorithms
  - 2) QDA, Cognitive Complexity & Software
    - 3) New trends
  - Discussion

Qualitative Computing in Timeline (decades)

- **1980**: much of the early literature appeared to be designed to convince
- **1990**: discussions about epistemological implications of computer use
- **2000**: discussions based on empirical analysis of program use or evaluation of software tools

Third Generation
Alternative to code-and-retrieve software
Specific use for qualitative „theory building“
  Model building capabilities
Use of knowledge based systems and artificial intelligence

*Computer’s metaphors we are living by*

  Computer as mindless clerk
    Computer as a tool
    Computer as a cognitive tool
  From Boolean operators searching to cyborgs imagery („to be one with the machine“)
  Computer as a metaphor for sistematicity, objectivity and rigour
    Computer as research assistant

1) *Theory Building & Computational Algorithms*

*Theory Building: Compositionial Relations*

  TAXONOMIC: relation among kinds
    MORPHOLOGICAL: relation between parts & wholes
    INCLUSIVE: relation among member of a set & the set itself
  EXEMPLARY: relation between objects & the categories they exemplify
    FUNCTIONAL: relation among steps in a production sequence

*Process of Theorizing*

Describing is depicting, telling a story without stepping back to interpret events

Conceptual ordering is organizing (and sometimes rating) of data according to a selective and specified set of properties and their dimensions

Theorizing is the act of constructing from data an explanatory scheme
Steps of Theory Building

**Conceptualizing:** naming phenomena, it is an abstract representation of an event, object or action.

**Defining and developing categories:** grouping concepts. Categories are concepts derived from the data.

**Relating categories:** through hypothesis or statements of relationships

Cognitive Processes

**Comprehension:** the researcher is able to write a complete, detailed, coherent, and rich description

**Synthesizing:** merging of stories, experiences, or cases to describe a typical, composite pattern of behavior

**Theorizing:** It is a process of speculation and conjecture, of falsification and verification, of selecting, revising, and discarding

**Recontextualization:** Is the development of the emerging theory

Schematic List of the Stages of Grounded Theory

1) Develop Categories
2) Saturate Categories
3) Abstract Definitions
4) Use the Definitions
5) Exploit Categories Fully
6) Note, Develop and Follow-up Links between Categories
7) Consider the Conditions under which the Links Hold
8) Make Connections, where relevant, to Existing Theory
9) Use Extreme Comparisons to the Maximum to Test Emerging Relationship

Debates in the Field
Closeness to the Data

- Does Software Drive Methodology?
  - Should New Researchers Start Off Doing Analysis by Hand?
  - Does Software Really Affect Rigor? Consistency? Thoroughness?

2) QDA, Cognitive Complexity & Software

GT & QDA: Comparison

- GT: transcendence
  - There is always a perception of a perception
    - True abstraction
  - Generates conceptual hypothesis and allows to develop a theory on core variable

- QDA: no transcendence
  - Focuses on description of time, place & people
    - lengthy descriptions
  - Confusion and mix between conceptualization and description

Data Analysis

It is a process of piecing together data, of making the invisible obvious, of recognizing the significant from the insignificant, of linking seemingly unrelated facts logically, of fitting categories one with another, and of attributing consequences to antecedents

Research
As Validation:
- Data is collected in order to test a preformulated conception, and while that testing can be immensely sophisticated it is not cognitive

As Cognitive Process:
- Researcher develops conceptual grasp as the study progresses and data is integrally involved in the conceptualization process itself

Data Mining & Pattern Analysis
- Data Mining: Process of exploration and analysis, by automatic or semiautomatic means, of large quantities of data in order to discover meaningful patterns and rules
- Pattern Analysis: Is often a sort of quasivariable analysis, not to create new categories or link them in new theoretical exploration but to investigate patterns in the data, describe them accurately and report their attterned occurrence

Soft Computing
- Fuzzy Computing
- Neuro Computing
- Evolutionary Computing
- Probabilistic Computing
  - Hybrid Methods
- Intelligent Agents and Agent Theory
  - Causal Models
  - Case-based Reasoning
  - Chaos Theroy
- Interactive Computational Models
  - Immunological Computing

Computing with Words
- Soft Data for Soft Computing
- Soft Computing for Soft Sociology
- Qualitative Computing for Soft Data
- Soft Data in Qualitative Computing
- Soft Computing in Qualitative Sociology
- Qualitative Computing on Qualitative Data

3) New Trends

**Popular Computational Algorithms**

- Fuzzy Logic
  - Decision Tree Analysis
  - Genetic Algorithms
- Kohonen Self-Organizing Map
- Back-Propagation Neural Network

**Useful Computational Algorithms**

- Kohonen self-organizing map (SOM), for cluster analysis. CA is a technique whereby people are grouped according similarities they share with one another and, conversely, differences they have with others.
- Decision Tree Analysis (DTA), for classification. Function is to predict the class membership of a set of cases (people) based on a list of characteristics (e.g., variables / measurements)

**Intelligent Strategies**
- Natural Language Understanding: Recognize patterns in text that suggest specific codes
  - Case-based Reasoning: Uses the codes already assigned to similar segments to recommend codes for the current segment
  - Machine Learning: regularities in the cooccurrence of codes & suggest additional codes
  - Semantic Networks: automated reasoning & natural language generation
    - Expert System: script that infer one code from other codes

**Affective Computing**

- „Computers have superior abilities for processing patterns, although humans remain superior at interpreting meaning in patterns“ (Picard: 1997)

**Discussion**

- Knowledge Discovery and Data Minning
- Digital Video Analysis large-scale projects
  - Artificial Intelligence
- Mixed Methods: Quantitative and Qualitative
  - Conceptual Ordering
  - Fuzzy Thinking
  - Metaphorical Approach
  - Abductive Inference