



## TECHNIQUES FOR COLLECTING QUALITATIVE FIELD DATA IN EDUCATION RESEARCH: EXAMPLE OF TWO STUDIES IN INFORMATION TECHNOLOGY FILED

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### Abstract:

Qualitative research methods have gained attention in education research because they enable investigation of several people-related issues that cannot be researched with the use of quantitative methods. Qualitative data are mostly collected as unstructured text by using variety of techniques. Collected data are grounded in research participants' experiences and everyday practice. Application of well-established methods for data collection and analysis ensures that research findings accurately present the investigated phenomenon. In this paper, are presented the excerpts from two studies that use different techniques in collecting qualitative field data. The studies are related to university level education within the field of information technology. Both authors in the course of their research used the principles of grounded theory to analyze the qualitative data. According to the experience that they have gained in this process, they reflect on some problems encountered during the process of collecting data, discuss the pros and cons of their choice and exemplify the most fruitful data that emerged in their studies. The paper concludes with some suggestions for further research in the field.

### Key words:

qualitative research,  
qualitative data,  
collecting qualitative data,  
education,  
information technology.

## INTRODUCTION

Studies that use quantitative approaches dominate in the literature on education. However, in situations where the goal is to explore the state of the practice or the human aspects of the education, using qualitative methods can be very fruitful. According to Koro-Ljungberg and Douglas [1] well-designed qualitative studies can answer research questions that cannot be answered through quantitative methods. Qualitative research methods have been recently adopted in education because they offer alternative approaches in collecting knowledge about the practice (empirical world).

Denzin and Lincoln [2] define qualitative research as a situated activity that locates the observer in the real world. Qualitative research consists of a set of interpretive, material practices that make the world visible. The main characteristic of qualitative research is that qualitative researcher studies things in their real settings. According to [3]:

*"...qualitative methods not only provide us with the means to explore such complex and chaotic real-life situations, but also provide us with methodological choices—multiple options about how to tackle such*

*a setting according to one's identified research problem and long-term research goals."*

The main source of qualitative data is field work, which means that researcher spends time in the real setting investigated in the study. Therefore, understanding of a person's social environment, or an organization's external context, is essential for overall understanding of a qualitative study, which is necessary for selecting appropriate data collection methods.

Data should be collected in the form that will increase understanding of human experience in the real life. However, qualitative researchers often do not know at the beginning of a study where they will find their most trusted information. Researchers often examine several sources that lead them to other sources in order to collect rich and trusty empirical data. Qualitative data may origin from several sources, and are transformed into written text that is suitable for further analysis. The main feature of well-collected qualitative data is that they focus on naturally occurring, ordinary events in natural settings, so that we have sound evidence on what is going on in the real setting [4]. This confidence to data is based on the fact that data are collected in the real context or from the people with real experience.



The rest of the paper is structured as follows. The second section presents the main issues in qualitative data collection. The third and fourth sections present two case studies conducted by the authors, while the fifth section contains the authors reflections on their practice in collecting qualitative data. The last section contains some conclusions and remarks.

## COLLECTING QUALITATIVE DATA

Qualitative perspectives and data collection methods have a long tradition in educational technology research [5]. Early qualitative studies were related to investigation of the use of media in the classroom, while experimental researchers have often used qualitative methods for collecting explanations of students behaviour or their attitudes. However, several researchers reported that quantitative studies dominate in the field of researching educational technology. For example, based on the investigation of the methodological properties of research reported in 144 articles that deal with human participants in major computer science education research journals from the years 2000-2005, Randolph et al. [6] reported that 74.3% of studies used quantitative methods, 15.3% of studies used qualitative methods, while 10.4% used mixed methods. Savenye and Robinson [5] conducted a literature review of publications and papers from the 20 years from 1980 to 2000 in the educational technology field. Literature review revealed 20785 publications in the field of educational technology, but only 100 publications were obtained after combining the terms educational technology and qualitative research during the search. Several reasons have contributed to the low number of qualitative studies in educational research [5]. The first is that qualitative research studies typically require more time to design, collect, and analyse data and to report the results comparing to quantitative studies. The next reason is the small number of experienced reviewers and journal editors that may recognize well-developed research reports of qualitative studies.

Methods for gathering data should be selected to fit the research question and to fit the preferred style of inquiry [7]. Using appropriate data collection methods can save time, decrease the effort, and increase meaningfulness of research findings. Qualitative findings grow out of three kinds of data collection methods [8]:

- ◆ *In-depth, open-ended interviews.* Interviews with open-ended questions are used to collect in-depth responses about people's experiences, perceptions, opinions, feelings, and knowledge. Open-ended interviews are the most widespread knowledge-producing technique in qualitative research.
- ◆ *Direct observation.* Observation is a field work that involves collecting impressions of the world in a systematic and purposeful way by using looking and listening. Collected data are in the form of field notes that are rich and detailed descriptions.
- ◆ *Written documents.* Written documents contain data such as organizational records, memorandums and correspondence, official publications

and reports, personal diaries, letters, and written responses to open-ended surveys.

Besides the primary data collection methods Marshall and Rossman [9] outlined in their book several secondary and supplemental methods such as focus groups, questionnaires and surveys, life histories and narrative inquiry, films and videos, photography, interaction analysis etc. Rigorous collection and analysis of qualitative data gathered as evidence about a topic contribute to a convincing body of knowledge that provide the basis for improving educational practices [10].

Qualitative data are usually collected in the form of unstructured text. These data are considered as rich, full, holistic and grounded in the field. Despite attractiveness of qualitative data, they have serious weaknesses and problems such as [11]: (1) collecting and analysing the data is a highly labour-intensive activity, (2) qualitative fieldwork is traditionally demanding, (3) qualitative data tend to overload the researcher badly at almost every point, and (4) methods of analysis are too flexible or not well formulated.

Method for data collection should be chosen related to the type of information sought. Variety of data collection methods have been reported in qualitative studies on education, while many of them combine several data collection methods over the course of the study. For example, in the study on learnability of hypermedia authoring tools [12] the authors collected data by audio cassette recorder during the sessions with tool users and IT trainers and after the session with tool users the authors asked participants to answer on a set of open-ended questions. In an exploratory study of qualitatively different ways in which teachers experience change in their understanding of subject matter they have recently taught [13] the authors employed in-depth interviews with teachers (before and after teaching a subject). During the qualitative study on the possible reasons for plagiarism within Australian universities [14] the authors recorded students responses in shorthand and note form during the interview, and immediately after interview they reviewed and amended notes, and created the full summaries of responses based on revised notes.

## CASE STUDY 1: SOFTWARE MAINTENANCE SERVICES ADOPTION IN THE VIRTUAL LABORATORY AT UNIVERSITY

The study was conducted in the period from December 2009 to February 2010 in the laboratory that is regularly used in the university courses. Laboratory enabled access to VNLab virtual network laboratory [15], which includes 20 workstations and two servers. In order to improve software maintenance of the laboratory, three types of services for submitting software change requests (SCR) were implemented [16]: specification of SCR in Microsoft Word document, specification of SCR by using Web form, and service integrated in the ScenarioBuilder application for managing networking scenario based on Network Node description Language [17].



The study used qualitative methods for investigating the implemented service adoption by the students. Qualitative research was conducted in order to discover characteristics of implemented SCR services based on the experience of students that are users of the services. However, some quantitative data were extracted with the aim to supplement qualitative findings [18]. The study had three research goals: (RG1) discovering advantages and disadvantages of three approaches for specifying software change requests in the laboratory, (RG2) comparing technical complexity of three approaches from the users' point of view, and (RG3) comparing user-friendliness of the approaches from the users' point of view.

### Research Participants

Students from the final year of bachelor studies, and students from master studies from Information Technology Department at Technical faculty "Mihajlo Pupin" participated in the research. In the research participated 22 students from bachelor studies and 9 students from master studies. Students participated to three experimental sessions on the voluntary basis. Data were collected in three experimental sessions, each of which lasted between 120 and 150 minutes.

### Data Collecting Methods

Data for qualitative exploration of services' advantages and disadvantages are collected by using questionnaire with open-ended questions [19]. Open-ended questions are used because they allow research participants to write answers in their own words, which reflect their opinion about investigated phenomenon. The following open ended questions are used for collecting opinions about implemented services:

1. Please state and describe advantages of SCR service in paper form.
2. Please state and describe disadvantages of SCR service in paper form.
3. Please state and describe advantages of Web form SCR service.
4. Please state and describe disadvantages of Web form SCR service.
5. Please state and describe advantages of SCR service integrated in the application context.
6. Please state and describe disadvantages of SCR service integrated in the application context.

Two additional open-ended questions were used to collect students' opinions about technical complexity of services (*Which approach is the simplest from the aspect of required technical skills and knowledge? Explain your answer.*), and user-friendliness of services (*Which approach is user-friendliest? Explain your answer.*).

Students were able to ask questions and discuss during the writing answers on open-ended questions, which helped them to formulate answers. Collected answers were in the form of unstructured text that is suitable for qualitative analysis. This kind of communication occurs in focus groups that are commonly used in qualitative

research. Advantages and disadvantages presented as the framework [20] are derived from students' answers based on categorization technique of extracting and refining concepts and categories [21].

In addition, in-depth descriptive field notes [19] were used for collecting data about the context, participants and experimental sessions. Field notes were written during the time the students wrote answers to questions [20].

### Data Analysis and Research Findings

Data analysis is based on coding techniques proposed by Charmaz [21]. Each piece of raw data collected from students was carefully examined and compared with previously analyzed data. Extensive memos were written during the whole process of data analysis. During the analysis were identified concepts that are related to advantages and disadvantages of offered services. After the analysing the third bundle of students' answers collected during the third session, the clear repetition of the identified concepts (advantages and disadvantages) has occurred, which means that there is nothing new to add to the corpus of previously analyzed data [22]. Research findings were presented as a frameworks with identified properties of SCR services [20].

### CASE STUDY 2: NEEDS ANALYSIS OF IT STUDENTS IN ELT IN SERBIA

The research was conducted from November 2011 to April 2012 at the IT departments at the following institutions of tertiary education in Serbia: Faculty of Organizational Sciences and Faculty of Electrical Engineering in Belgrade, Faculty of Technical Science, Faculty of Science and Higher Technical School of Professional Studies in Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Faculty of Technical Science in Čačak and Higher Technological School of Professional Studies in Šabac. The aim of the research was to elicit the needs related to four basic skills of IT students in Serbia and to provide a new framework for the organisation of English Language Teaching at IT departments in Serbia.

### Research Participants

The sample included 38 professors and 38 assistants teaching IT subjects and 785 IT students of II and III year at IT department where the research was conducted. The subsample for the interviews included 34 participants (10 professors, 10 assistants and 14 students). The author was interested in seeing whether there were any marked differences between the opinion of professors, assistants and students, likewise whether there were any differences between the opinion of the students of the second and third year of study.

### Data Collecting Methods

Three techniques were used to collect two types of data in the research: quantitative and qualitative. There are nu-



merous definitions of qualitative research, therefore we will provide just one: “Explaining phenomena by collecting numerical data that are analyzed using mathematically based methods (in particular statistics)” [23]. In our case, to collect quantitative data we used two *questionnaires*, one for students and one for professors and assistants. The questionnaire for students had the main focus to evaluate the students’ attitudes and capabilities in the scope of four main skills (*writing, speaking, reading and listening*) in the light of their present and target professional needs. The focus of the questionnaire for professors and assistants was directed also to the needs of IT students but from the angle of professionals in IT field.

The extensive definitions were given on qualitative research and its main features in the introductory part of the paper so we will not elaborate on it here. Techniques that we used to collect qualitative data are the following:

- ♦ *Semi-structured interview*. The questions were the same for all three subsamples: professors, assistants and students. The author was interested in the different perception that was got from these three, from one point, very similar and from the other point very different populations.
- ♦ *Content analysis* of English courses specifications given in the curricula downloaded from the websites of departments where the research was conducted.

## Data Analysis and Research Findings

Different techniques were used for the analysis of quantitative and qualitative data. For the analysis of quantitative data SPSS software was used to do the following statistical tests: chi-square test, t-test, standard deviation, arithmetic mean and correlation [23]. This kind of analysis enabled us to see different needs, attitudes and capabilities between the population studying at Higher Schools of Technical/Technological Studies and the population studying at faculties and to support noticed differences with numerical data that address the whole sample.

To analyse the qualitative data the author followed some of the procedures provided by Kathy Charmaz, one of followers of grounded theory, whose work has been already mentioned by the co-author earlier in the paper [21]. The main techniques used to analyse the interviews were Initial Coding (Line-by-Line Coding), Focused Coding, Theoretical Coding and Memos. The main difference between the procedures used by the two authors is that Stojanov used them during the whole course of the research while Dabić used them after all the data were collected.

At this point, it is necessary to mention that, after realising how fruitful were the interview data obtained by the use of grounded theory techniques, the author decided to apply the same techniques to analyse English courses specifications and only memos [24][25] to comment the statistically significant data obtained through quantitative research/analysis and to draw the conclusions from data collected from three sources to discuss the formulated hy-

potheses. The content analysis of English courses specifications made it possible for certain clusters of activities to be made in four broad areas: general English, English for Academic Purposes, Business English and English for Specific Purposes. The essence of presence of the activities from the mentioned four areas (GE, EAP, BE and ESP) in ELT (English Language Teaching) were directly related to the needs that emerged for IT students in questionnaires and interview analysis.

## REFLECTIONS ON EXPERIENCE

The first study was aimed at identifying advantages and disadvantages of software maintenance services implemented in a virtual network laboratory at university. The reason for conducting the research was to collect students’ opinions that will be used for further improvement of the services. This led to the adoption of qualitative research methods during the research planning. Due to the technical background of the researcher (computer science university education), the use of qualitative research methods was demanding and very exciting experience (something completely new). Because of the nature of the investigated problem, the collection of data was organized by using open-ended questions in questionnaire distributed to students during the experimental sessions. Because of the author’s inexperience in handling qualitative data collected as the unstructured text, the author decided to use well-defined coding techniques borrowed from grounded theory approach for data analysis [21]. Although, in the research was not strictly followed the research procedure used in pure grounded theory studies [26][21][27], research findings helped the researcher to identify advantages and disadvantages of services. After analysing collected data and research findings, and systematic literature review, the author recognized that the most valuable data for qualitative research are data collected by using in-depth semi-structured interviews and focus groups, which was used in the next study about the software maintenance practice in local small software companies [28]. In addition, tape recording of students’ discussion during answering open-ended questions would positively contribute to the quality of the research findings and the validity of the study. Nevertheless, collected and analyzed data enabled identification of improvement directions for services in the laboratory.

The second study was aimed to present the relevant knowledge and skills needed to future IT specialists to be highly competent in using English in everyday, business and professional situations as well as detecting main obstacles standing on that way. The aim was accomplished through the use of mixed-method research what contributed to high validity and immersion of different perspectives on a phenomenon. Concerning the strength and value of the collected data, the qualitative data collected by the means of semi-structured interview emerged as the most valuable ones. The quantitative data emerged as the ones that gave confirmation to the conclusions obtained from the data collected by the interviews while the data



obtained from the content analysis of the English courses specifications provided the opportunity to compare the data we got (from the questionnaires and the interviews) with the situation existing at IT departments in Serbia in regard to ELT and organization of English courses. Dabic believes a good start for a novice researcher to be a mixed-method research where one can try out two or more different methods and afterwards decide which suits them best [29][30]. According to the literature, the main advantage of qualitative research over quantitative is: “that we can add a new piece to the research puzzle – *while we gather data*–that can even occur later in the analysis”[21]. At the same time, Charmaz points out the *flexibility* of qualitative research which is, especially in the concept of grounded theory, increased and simultaneously provide more focus than many other methods permitting the researchers to follow the leads that emerge [21]. In regards to the content, in this case text analysis, in [31] was stated that texts do not stand as objective facts although they often represent what their authors assumed were objective facts. Furthermore, he states that people construct texts for specific purposes and they do it within social, economical, historical, cultural and situational reasons. This is actually one of the drawbacks of content analysis of English courses specifications because the author analysed individual realities viewed by the teachers of English for Specific Purposes from IT departments that exist in different situational contexts. All these realities were looked through the prism of the same parameters and compared to the emerged categories in qualitative research and results that emerged as statistically significant in quantitative research which led the author to offer a new framework for the organization of English courses as well as innovative methods for language teaching.

## CONCLUSIONS

Qualitative research is widely used in social and behavioural sciences, health science and recently in education. Qualitative research can be implemented by using different approaches, which use variety of data collection methods. Review of literature, and the authors’ experience revealed that qualitative evidence supported by rigorous analysis techniques makes it possible to uncover and consider the complexities of human intensive activities in education field. Due to the high importance of information technologies in every aspect of human living, investigation of human side of information technology education by using qualitative research methods has become very important. Reported case studies outlined some issues related to problems the authors met during the gathering qualitative data in their researches. Based on the own experience, the authors presented their reflections on problems and suggestions for qualitative data collection.

Further research may be directed towards combining variety of qualitative methods for data collection in the same study or using mixed methods. The promising and under-researched field is related to using electronic data collection methods.

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