

# webQDA - Qualitative Data Analysis Software

## Usability Assessment

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**Abstract** — The use of qualitative analysis to support software has been growing. The integration of these types of tools in research is accompanied by an increase in the number of software packages available. Depending on the design and research questions, researchers can explore various solutions available in the market. Thus, it is urgent to ensure that these tools, apart from containing the necessary functionality for the purposes of research projects, are also usable. This study presents an assessment of the usability of the qualitative data analysis software webQDA® (version 2.0). To assess its usability, the System Usability Scale (SUS) was used. The results indicate that the current version is "acceptable" in terms of usability. We therefore hope, with this assessment, to make decisions so as to improve the usability of the new version of webQDA® (version 3.0).

**Keywords** - Usability, Qualitative Computing, Qualitative Research, Qualitative Data Analysis, User Centered Design.

### I. INTRODUCTION

The evaluation of usability is much discussed, especially when we approach the graphic interfaces software. The study of usability is critical because certain software applications are "one-click" away from being or not used in an appropriate manner.

Usability comes as the most "rational" side of a product, allowing users to reach specific objectives in an efficient and satisfactory manner. Moreover, the User Experience is largely provided by the feedback on the usability of a system, reflecting the more "emotional" side of the use of a product. The experiment is related to the preferences, perceptions, emotions, beliefs, physical and psychological reactions of the user during the use of a product [1]. Thus, one comprehends "the pleasure or satisfaction" that many interfaces offer users. It is an evidence of efficiency in the integration of the concepts of Usability and User Experience in the development of Human-Computer Interaction solutions (HCI) [2]. Despite being linked, in this article we will focus the study on the dimension of Usability.

When dealing with authoring tools, in which you have to apply your knowledge to produce something, it becomes even more sensitive to gauge the usability of the software. Being webQDA® (www.webqda.net) an authoring tool for qualitative data analysis and a new version of it being developed (available April 2016) [3], it is of extreme relevance not to keep this dimension in mind.

webQDA (Web Qualitative Data Analysis) is a qualitative data analysis software in a collaborative, distributed environment (www.webqda.net). Although there are some software packages that deal with non-numeric and unstructured data (text, image, video, etc.) in qualitative analysis, none of them can be used by several researchers in a collaborative and distributed environment such as the Internet can offer. webQDA is a software directed to researchers in academic and business contexts who need to analyze qualitative data, individually or collaboratively, synchronously or asynchronously. webQDA follows the structural and theoretical design of other programs, being differentiated by providing online collaborative work in real time and a complementary service to support research [4].

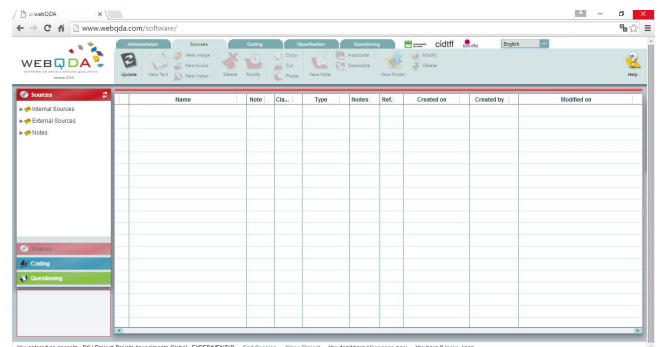


Figure 1. webQDA desktop

Within this article, we define as the main objective to answer the following question: How to assess usability and functionality of the qualitative analysis software webQDA? After these initial considerations, it is important to understand the content of the following sections of this article. Thus, in Section II we will present concepts associated with Qualitative Computing. Section III will discuss the role of User Centered Design in software development. In turn, in Section IV, we present the methods and techniques for assessing the usability of software. In the last section (V), we present the results of this study. And finally, we conclude with the study's findings.

### II. QUALITATIVE DATA ANALYSIS SOFTWARE (QDAS)

The use of software for scientific research is currently very common. The spread of these computational tools can be perceived through the popularization of software to quantitative and qualitative research. Nevertheless, are nonspecific and quantitative tools, like Word®, SPSS®, Excel® etc. that there are major incidence or dissemination. This release is also

reflected in the large number of books that can be found to quantitative research. However, the integration of specific software for qualitative research is a relatively minor phenomenon.

In the context of postgraduate educational research in Brazil some authors [6] studied the use of computational resource to research. They concluded that among those reported using software (59.9%), has a higher frequency the use of quantitative analysis software (41,1%), followed by qualitative analysis software (39.4%) and finally the use of bibliographic reference software (15.5%).

The so-called Computer-Assisted Qualitative Data Analysis Software or Computer Assisted Qualitative Data Analysis (CAQDAS) are a kind of systems with more of three decade [7]. Today we can simply call them Qualitative Data Analysis Software (QDAS).

However, even today many researchers are unaware of these specific and useful tools. Puebla [8] specifies at least three types of researchers in the field of qualitative analysis: i) Researchers who are pre-computers - those who prefer colored pencil, paper and note cards; ii) Researches using non-specific software, such as word processors, spreadsheet calculations and general databases, and iii) Researchers using specific software to analyze qualitative research, such as NVivo, Atlas.it, webQDA, MaxQDA, etc.

We can summarize the story of specific qualitative research software in some chronological points:

- 1) In 1966, MIT developed “The General Inquiry” software to help text analysis, but some authors [9], [10] refer that this was not exactly a qualitative analysis software.
- 2) In 1984, the software Ethnograph comes to light, and still exists in its sixth version. (<http://www.qualisresearch.com/>).
- 3) In 1987, Richards & Richards developed the No-Numerical Unstructured Data Indexing, Searching and Theorizing (NUD\*IST), the software that evolved to the current NVivo index system.
- 4) In 1991, the prototype of the conceptual network ATLAS-ti is launched, mainly related with Grounded Theory.
- 5) Approximately in the transition of the 2000 decade it was possible to integrate video, audio and image, in text analysis of qualitative research software. Nevertheless, HyperRESEARCH had been presented before as software that also allowed to encode and recover text, audio and video. Transcriber and Transana are other software systems that emerged to handle this type of data.
- 6) In 2004, “NVivo summarizes some of the most outstanding hallmark previous software, such as ATLAS-ti - recovers resource coding in vivo, and ETHNOGRAPH – a visual presentation coding system” [10].

- 7) 2009 marks the beginning of the developments of qualitative software in cloud computer contexts. Examples of this are Dedoose and webQDA, that were developed almost simultaneously in USA and Portugal, respectively.
- 8) From 2013 onwards we saw an effort from software companies to develop iOS versions, incorporate data from social networks, multimedia and other visual elements in the analysis process.

Naturally this story isn't complete, we can include other details and software such as MaxQDA, AQUAD, QDA Miner, etc. For example, we can see a more exhaustive list in Wikipedia's entrance: “Computer-assisted qualitative data analysis software”.

What is the implication of Qualitative Data Analysis Software on scientific research in general and on qualitative research specifically? Just as the invention of the piano allowed composers to begin writing new songs, the software for qualitative analysis also affected researchers in the way they dealt with their data. These technological tools do not replace the analytical competence of researchers, but can improve established processes and suggest new ways to reach the most important issue in research: to find answers to research questions. Some authors [11], [13] recognize that QDAS allow making data visible in ways not possible with manual methods or non-specific software, allowing for new insights and reflections on a research or *corpous* of data.

Kaefer, Roper, and Sinha [11] wrote a paper with step-by-step QDAS software description about the 230 journal articles analysis about climate change and carbon emissions. They concluded that while qualitative data analysis software does not do the analysis for the researcher, “it can make the analytical process more flexible, transparent and ultimately more trustworthy” [11]. There are obvious advantages in the integration of QDAS in standard analytic processes, as these tools open new possibilities, such as agreed by Richards [7]: i) computers have enabled new qualitative techniques that were previously unavailable, ii) computation has produced some influence on qualitative techniques.

We can summarize some advantage of QDAS: i) faster and more efficient data management; ii) increased possibility to handle large volumes of data; iii) contextualization of complexity; iv) technical and methodological rigor and systematization; v) consistency; vi) analytical transparency; vii) increased possibility of collaborative teamwork, etc. However, many critical problems present challenges to the researchers in this area.

There are many challenges in the QDAS field. Some are technical or computational issues, whereas other are methodological or epistemological prerequisites, although Richard, in 2002 [14], recognized that methodological innovations are rarely discussed. For example, Corti and Gregory [15] discuss the problem of exchangeability and portability of current software. They argue the need of data sharing, archiving and open data exchange standards among QDAS, to guarantee sustainability of data collections, coding and annotations on these data.

Several researchers place expectations on the QDAS' utilities in an unrealistic basis, while others think that the system has insufficient analytical flexibility. Richards [14] refers that many novice researchers develop a so-called "coding fetishism", that transforms coding processes into an end in itself. For this reason, some believe that QDAS can reduce critical reading and reflection. For many researchers, the high financial cost of the more popular QDAS is a problem, but in this paper we would like to focus on the challenge of the considerable time and effort required to learn them.

Choosing a QDAS is a first difficulty, that, in several cases, is coincidental with the process of qualitative research learning. Kaefer, Roper and Sinha [11] suggest to compare and test software through sample projects and literature review. Today, software companies offer many tutorial videos and trial times to test their systems.

Some authors [16] studied the determinant factors in the adoption and recommendation of qualitative research software. They analyzed five factors: i) Difficulty of use; ii) Learning difficulty; iii) Poor relation between quality and price; iv) Poor contribution to research; and v) Insufficient functionality. These authors indicate the two first factors as the ones found most cited in the corpus of the data analyzed:

- "NVivo is not exactly friendly. I took a whole course to learn to use it, and if you don't use it often enough, you're back to square one, as those "how-to" memories tend to fade quickly." **Difficulty of use**
- "I use Nvivo9 and agree that it is more user-friendly than earlier versions. I do not make full use of everything you can do with it however - and I've never come across anyone who does" "NVivo".

#### **Learning difficulty**

In this context it is very important to study the User Experience and Usability of the QDAS, because these types of tools need to be at the service of researcher, and not the opposite, therefore reducing the initial time of learning and increasing the effectiveness and efficiency of all processes of analysis. Usability is an important dimension in the design and development of software. It is important to understand when to involve the user in the process.

### III. THE ROLE OF USER CENTERED DESIGN

User Centered Design (UCD) describes the processes of a project where end users have large influence and intervention on how it is conducted. Some UCD methods inquire users about the needs they have in a particular educational area, involving them in specific parts of the development process. On the other hand, there are methods in which users have greater presence, integrating the team, i.e., they are involved as elements throughout the process [17].

UCD is described in ISO 9241-210 [18] - Ergonomics of Human-System Interaction (210: Human-centered design for interactive systems). This standard describes an ideal situation where there are no barriers to the application of UCD assumptions, except for the possible lack of competence on the part of the development team [19]. Authors like Facer and Williamson [20], among others, emphasize that UCD is a

methodology that combines, among other things, the participation of the user and formative evaluation of prototypes. According to the ISO 9241-210 [18] standard, UCD projects are governed by six principles:

- Explicit understanding of users, tasks and environments;
- Establishment of a multidisciplinary team;
- Interaction between the user and the system;
- Active involvement of users;
- User experience; and
- The iteration of design solutions.

Based on what we described in this section, we completely agree with the report "Quality Framework for UK Government Website Design: Usability issues for government websites", when it argues that UCD is a complement to software development methods and not a substitute for them [21].

### IV. USABILITY EVALUATION: METHODS AND TECHNIQUES

From the assumptions and methods defined in User Centered Design, it appears that one of the proposed improvements to be implemented requires not only to involve the user in the evaluation (as verifier), but to integrate him/her into the team, as informant or co-designer [22]. Iterative Design is one of the most important methods for User Centered Design, and user satisfaction is the most effective measure [23, 24]. This reinforces the importance of involving the user not only in the evaluation phase, but in all processes.

#### *A. Researcher/User Involvement*

Once identified that the phases that the users' involvement in the development process provides a source of knowledge about the context of use, tasks, and how users tend to work later with the software, it is emphasized, however, that the degree of user involvement can vary depending on the tasks being performed. This form of involvement is usually referred to as Participatory Design. For example, Costa [25] mentions the end users move from a less active role, such as checkers (testers), to more interventional roles, such as informers or co-designers [26], and regarded as members of the multidisciplinary team. The new methods of User Centered Design, which aim to integrate the Hybrid Methodology for User Centered Development [27], include the integration of the user in the early stages of the development process.

#### *B. Quality factors for software development*

A software quality system must ensure the fundamental objectives:

- **Incorporate quality:** based on the tools used and the software development methodologies;
- **Preserve the quality:** when modifications to the software should seek to maintain the quality level of the previous version.

The ISO 9126 standard also includes six dimensions (Usability, Functionality, Reliability, Efficiency, Service and Portability) that must be taken into account in measuring the

quality of use of a software. Regarding usability, size study of this article relates to a set of attributes that must contain certain software so that users can achieve their goals with efficiency, effectiveness, and satisfaction of use in a particular context of use. Metrics for evaluating usability are:

- **Effectiveness:** accuracy and completeness with which users achieve goals;
- **Efficiency:** resources expended in relation to the accuracy and completeness with which users achieve goals;
- **Satisfaction of use:** comfort and positive attitudes regarding the use of software;
- **Context of use:** comprising users, tasks, equipment (hardware, software and materials), the physical and social environment in which the software is used.

Despite the ISO 9126 providing 6 dimensions, in this study we will focus on the proposal to evaluate the usability of webQDA qualitative analysis software.

For an effective understanding of usability, there are quality factors that can be assessed through the evaluation criteria. Collecting and analyzing data to answer the following questions will help determine if the software is usable or not [28]:

- Is it easy to understand the theme of the software? (Understandable)
- Is it easy to learn to use it? (Ease of learning)
- What is the speed of execution? (Use efficiency)
- Does the user show evidence of comfort and positive attitudes to its use? (Subjective satisfaction),

The criteria defined by the standards are essentially oriented to technical issues. However, for a qualitative analysis to support that a software is of quality it is necessary to take into account the research methodologies. Being an authoring software, researchers / users need to have knowledge of the techniques, processes and tools available in terms of data analysis in qualitative research. For beginners, the learning at the level of the research methodology itself takes place at the

### C. Stages in Software Evaluation

The evaluation centered on the User serves three purposes: provide support for decision-making, detect problems, and verify the quality of the software. These objectives make User-Centered Evaluation a valuable tool for multidisciplinary teams, because it justifies their efforts, improving the software and supporting the development team in making decisions regarding the version of the software to implement. According to Velsen et al. [29], depending on the phase you are in the project, evaluation can serve different purposes. In the initial phase, in which there is still no software, evaluation provides information to support decision-making, at an intermediate stage and through the submission of prototypes, allowing to detect problems. In the final phase, already with a full version of the software, it allows assessing its quality (see Table 1).

TABLE 1 – PHASES, FACTORS AND TOOLS

Phases	Factors	Tools
Before the development of the <i>software</i>	Characteristics of the user Requisites of the user	Questionnaires Interviews Focus groups
Prototype of reduced fidelity	Appreciation Perceived utility Aspects of Security and Privacy	Interviews <i>Focus groups</i>
Prototype of high fidelity	Appreciation Adequacy Comprehensibility Aspects of Security and Privacy Usability User behavior User performance	Questionnaires Interviews Think-aloud protocols Observation
Final version of the <i>software</i>	Appreciation Adequacy Aspects of Security and Privacy User experience User satisfaction Usability User performance	Questionnaires Interviews Think-aloud protocols Observation

As shown, for measuring the quality of a software, it is important that assessment takes place throughout the process. Thus, it can be inferred that the more "refined" and suitable for the process of development and evaluation, the better the software quality.

## II. WEBQDA USABILITY EVALUATION: METHODOLOGICAL ASPECT

In terms of this article, for the evaluation of usability we applied a questionnaire to users of version 2.0 of webQDA. The results will support decision-making by the development team in the design of version 3.0 of webQDA ([www.webqda.net](http://www.webqda.net)). To evaluate its usability, we used the System Usability Scale (SUS) [30].

### A. Using SUS

SUS is generally used after the respondent has had an opportunity to use the system being evaluated, but before any debriefing or discussion takes place. Respondents should be asked to record their immediate response to each item, rather than thinking about items for a long time. All items should be checked. If respondents feel that they cannot respond to a particular item, they should mark the center point of the scale.

### B. Scoring SUS

SUS yields a single number representing a composite measure of the overall usability of the system being studied. Note that scores for individual items are not meaningful on their own. To calculate the SUS score, first add the score contributions from each item. Each item's score contribution will range from 0 to 4. For items 1, 3, 5, 7 and 9, the score contribution is the scale position minus 1. For items 2, 4, 6, 8 and 10, the contribution is 5 minus the scale position. Multiply the total result of the scores by 2.5 to obtain the overall value of the SU [30]. If the result is less than 68 points, it should lead the team to conclude that the software faces usability problems.

Less than 50 points may be an indicator that you need to invest in the interface design and its usability.

SUS consists of only 10 closed questions and their respective Likert scale representation (1- Strongly disagree, 5 Strongly agree):

- 1) I think that I would like to use this system frequently.
- 2) I found the system unnecessarily complex.
- 3) I thought the system was easy to use.
- 4) I think that I would need the support of a technical person to be able to use this system.
- 5) I found the various functions in this system were well integrated.
- 6) I thought there was too much inconsistency in this system.
- 7) I would imagine that most people would learn to use this system very quickly.
- 8) I found the system very cumbersome to use.
- 9) I felt very confident using the system.
- 10) I needed to learn a lot of things before I could get going with this system.

### III. RESULTS

The questionnaire was made available online and sent to the users' database with ongoing projects in webQDA (version 2.0). We obtained 93 responses. We got as an average central tendency 70 points (SD = 14.2), which allows us to conclude that webQDA 2.0 was "acceptable" in terms of usability, according to the SUS criteria. Figure 2 shows the scatter plot of these values with a minimum value of 30 points and a maximum of 100 points.

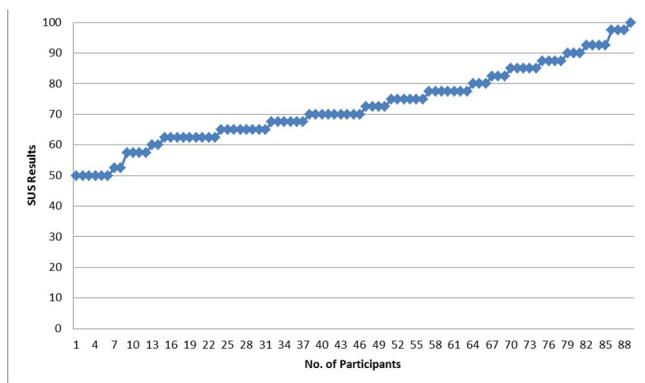


Figure 2. Line graph (SUS results vs No. of participants)

Figure 3 shows the results obtained in figure 2 regarding the level of experience / skill attributed to the use of the qualitative analysis support software. In the application of the questionnaire survey, 4 levels of experience were assigned:

- Level 0 - I do not know use
- Level 1 - Just in need to learn to use a few more features
- Level 2 - Enough to use in my research / survey

- Level 3 - Specialist (can give advice or training)

It is of interest to assess if the level of user-assigned experience influenced the outcome of SUS.

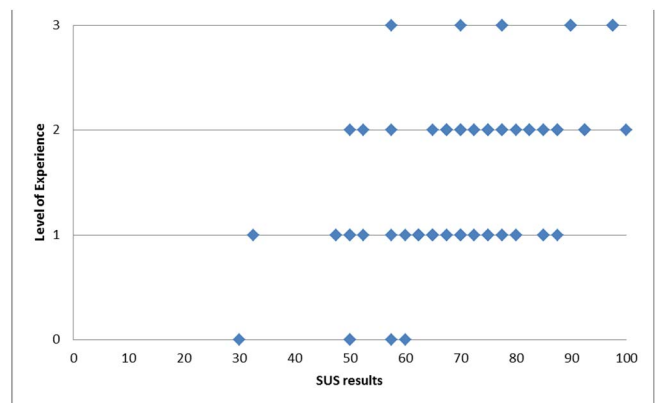


Figure 3. Dispersion graph as to Level of Experience vs SUS results

Analyzing SUS results lower than 68 points, a result which shows that the software can / has usability issues in relation to the level of experience, we obtained:

- Level 0 - 5 participants (5.4%)
- Level 1 - 27 participants (29%)
- Level 2 - 8 participants (8.6%)
- Level 3 - 1 participant (1%)

### IV. CONCLUSIONS

In conclusion and in response to our guiding question, we note that the use of the System Usability Scale (SUS) in the evaluation of version 2.0 of webQDA enabled the multidisciplinary team to be in possession of a deeper analysis of the new interface being developed for release 3.0 of webQDA. It is noteworthy that SUS was effective for its speed in obtaining data. They will be enhanced and complemented with the analysis of the open questions also collected in the questionnaire, and we hope to identify the most critical points. The development team is preparing to triangulate these findings with others that have been collected, for example the operating life of the webQDA and its use in a project, and the degree of methodological knowledge (types and research designs) of its users when using the software.

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