

4-1-2017

Qualitative Analysis Using R: A Free Analytic Tool

Samantha Estrada

University of Northern Colorado, samantha.estrada@unco.edu

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Recommended APA Citation

Estrada, S. (2017). Qualitative Analysis Using R: A Free Analytic Tool. *The Qualitative Report*, 22(4), 956-968. Retrieved from <http://nsuworks.nova.edu/tqr/vol22/iss4/2>

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Abstract

R (R Development Core Team, 2011) is a powerful tool to analyze statistical data. In recent years R has gained popularity because the software is free and open source. However, evaluators and researchers do not exclusively use quantitative data. It is possible to perform qualitative analysis in R. Using data from a case study exploring a family psychoeducation recovery course, this article provides users a tutorial on how to perform a qualitative analysis and data visualization using R.

Keywords

R, RQDA, Qualitative Research, Thematic Analysis

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Qualitative Analysis Using R: A Free Analytic Tool

Samantha Estrada

University of Northern Colorado, Greeley, Colorado, USA

R (R Development Core Team, 2011) is a powerful tool to analyze statistical data. In recent years R has gained popularity because the software is free and open source. However, evaluators and researchers do not exclusively use quantitative data. It is possible to perform qualitative analysis in R. Using data from a case study exploring a family psychoeducation recovery course, this article provides users a tutorial on how to perform a qualitative analysis and data visualization using R. Keywords: R, RQDA, Qualitative Research, Thematic Analysis

Installing R

R is an open source statistical software. The website for The R Project for Statistical Computing where users can download R can be found in the references for this paper. R can be installed in UNIX platforms, Windows, and MacOS. The directions presented in this article are based on R version 3.1.1.

Setting the working directory helps users when reading or writing files to a specific location. While this is not necessary to run the R package for Qualitative Data Analysis (RQDA) and other packages used in this article, it will make it easier for R users in the long run as the user will avoid having to search in different folders for files. In R, the symbol # defines a comment. A comment is basically an annotation for the programmer and will not be executed by the program. For example, reading a file from a folder “Case Study” within the “Documents” folder in the C drive would look like:

```
# Set the working directory  
setwd("C:\\Documents\\Case Study")
```

If using Windows, it is recommended to use double slash when writing the path “\\”; however, if using Mac, use the forward slash instead “/”.

RQDA

The RQDA package is a free qualitative software application that can be used instead of more expensive qualitative software. Huang (2014) states that RQDA is an “integrated platform for both quantitative and qualitative data analysis” (para 1). RQDA is a useful tool for evaluators and students alike. In order to use any package in R, in this case the RQDA package created by Huang (2014), it is necessary to load and install the package in R. This is a one-time procedure; however, if the user wishes to open the RQDA files in a different computer, it will be necessary to install R and the RQDA package again.

The first step would be to open R once the software is installed in the computer. To be able to install a package the user must open R and click on the “Packages” top menu. A new drop-down menu will appear from this list. The user should select “Install package(s)” then a new pop up window will appear on the screen. This pop-up window is a Comprehensive R Archive Network (CRAN) mirror. Select the preferred location from the list and click OK. A new window labeled “Packages” will appear on the screen, and from this list it is necessary to

locate RQDA. Click OK and allow the RQDA package to download. A window should pop-up prompting the user to install “Gtk+”.

The next step is to agree to install this package. To load the RQDA package into R, the user must go back to the “Packages” menu in R and select “Load package...” from the drop-down menu. A pop-up window labeled “Select one” will appear to the user. The user should then select RQDA from the list and click OK. It is important to remember that the RQDA package should only be installed once; however, the RQDA package must be loaded at the beginning of every session. This can be done using the command: `library(RQDA)`. The RQDA package should load and a new pop-up GUI (Graphical User Interface) of RQDA should appear.

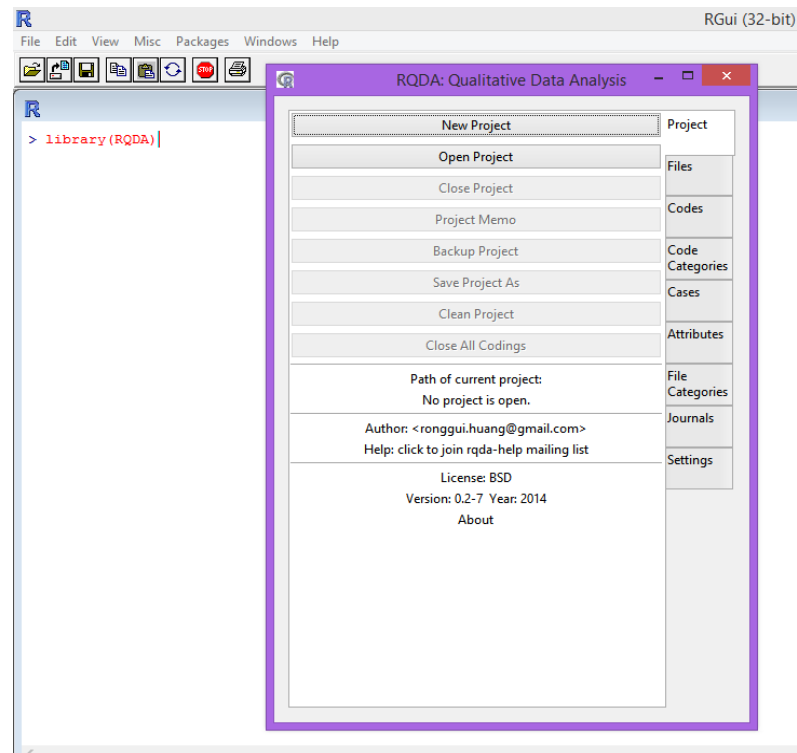


Figure 1. Image of the RQDA GUI at the start

Installing RQDA with Code

Likewise, the following code can be used to install RQDA.

```
#Installing RQDA
install.packages("RGtk2")
install.packages("RQDA", dependencies = TRUE)
require(RQDA)
RQDA()
```

In this syntax, the code `<dependencies = TRUE>` will allow the installation of any other packages necessary to run RQDA. After the RQDA package has been installed for the first time, the package can be re-opened by using the following code:

```
#Re-opening RQDA in a different session
library(RQDA)
RQDA()
```

Loading Qualitative Data

To be able to load qualitative data such as interview transcripts, the user should click in the “New Project” button. Then, the user should give the project a name, and select where to save the project, for example, *Documents* folder. This will create a file with the extension .rqda. The user should note that it is possible to transfer this file to a different computer and open the project given that R and RQDA are installed on that computer. After creating a project, files can be imported into the project. These files can be the interview files after transcription. Files can be imported by clicking the “Import” button under the “Files” tab. It is recommended that the file should be plain text with an ASCII encoding (Huang, 2014). If it is necessary to open a file and read it, the user will need to click the “Open” button or double click on the file. If a file needs to be deleted, the user must first select the file and then click the “Delete” button. Under the “Settings” tab, the user will be able to change or edit the name of the coder, along with other customizations such as color. This is a useful setting in projects where there is more than one coder.

Thematic Analysis

In the evaluation field, the collection of qualitative data is common. Thematic analysis is widely used by researchers and evaluators alike (Braun & Clarke, 2006). In fact, thematic analysis is one of the first methods the qualitative researcher learns, and it is the basis to learning and performing different types of qualitative analyses (Braun & Clarke, 2006). Thematic analysis works by having the researcher analyze the data, searching important emerging themes in describing the case or phenomenon of interest. A theme refers to a specific pattern that consistently can be found in the data. Next, the researcher aggregates the information into large “clusters of ideas and provides details that support the themes” (Creswell, 2007, p. 244). The result of thematic analysis should emphasize the most prominent characteristics and meanings contained within the data.

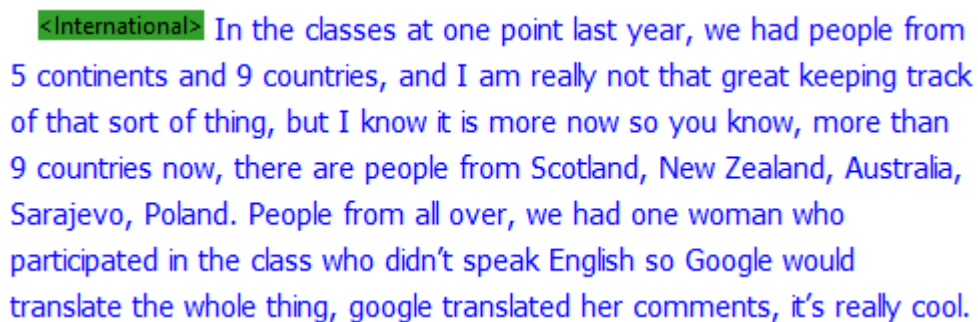
Perform Thematic Analysis Using RQDA

For this article, the data used will be from a case study evaluation from an online recovery course (Estrada, 2016). The author interviewed four different participants regarding their perspectives and experiences with an online recovery course. After analyzing the data, the researcher identified six major categories from the interviewees’ responses: (a) Recovery oriented psychoeducation, (b) Online format of psychoeducation, (c) Curriculum and class mechanics, (d) Need for the program, (e) Future program direction (f) Limitations of the program. Four separate interviews were uploaded to RQDA.

In order to create themes, the user must click the “Codes” tab. The user should think of “Codes” as the themes in thematic analysis. Depending on the framework of the study, the codes can be created theoretically. If a code is created theoretically, it is driven by the researcher’s knowledge and expectations of the content area and data collected. The choice between inductive and theoretical thematic analysis is one made by the researcher. Yet, the choice determines how the data will be coded. For example, in theoretical thematic analysis a code could be one of the research questions for the study.

Once the researcher has decided between inductive or theoretical, the next step is to begin coding. The user should begin by opening a transcript, and reading through the data. When the user identifies a theme in RQDA, he or she should select the text and under the “Codes” tab to select the “Mark” button. This will highlight the text and create a label at the beginning of the code. **Figure 2** shows the result of clicking in the “Mark” button: the label

<International> is created at the beginning of the highlighted text. The code and theme “International” contains all the references made by the participants in this study describing the background diversity participants in the online psychoeducation course. To check on the data that has been coded, the user can double-click on the code. The process of code retrieval will gather everything that has been coded under that theme. The codes that pertain to Online Psychoeducation will appear in a separate pop-up window, which will also contain the number of codes as well as information on the original source of the text. If it is necessary to undo a coding, the user must select the same text and click the “Unmark” button. A coding is successfully deleted when the highlight is no longer seen.



<International> In the classes at one point last year, we had people from 5 continents and 9 countries, and I am really not that great keeping track of that sort of thing, but I know it is more now so you know, more than 9 countries now, there are people from Scotland, New Zealand, Australia, Sarajevo, Poland. People from all over, we had one woman who participated in the class who didn't speak English so Google would translate the whole thing, google translated her comments, it's really cool.

Figure 2. After coding under the “international” theme

Within the RQDA package the user is able to right click on any code under the “Codes” tab in order to either highlight all codings within a specific theme; code a specific theme under the memo section of RQDA, or show specific codes stored under the theme, memos or categories. It is also possible to sort the codings and codes in a specific theme by using this menu, as well as to assign colors to the codes.

Cases

The user can create a case under the “Cases” tab. Creating a case will allow the researcher to assign attributes to that case. A file can be assigned to a case in two ways. The first is by adding an entire file to a case. This is done by selecting the file under the “Files” tab right-clicking so that a pop-up menu appears, and then selecting “add to case...” The second form a file can be assigned is by selecting a case name and then clicking the button “Link” under the “Cases” tab.

Confidentiality is important in qualitative research. Often, qualitative researchers use pseudonyms and unidentifiable IDs. The command `getCases()` is helpful when it is necessary to identify the case ID as well as the case name, or pseudonym, given to the participants. This command can also be useful when opening data that has not been used over a certain period of time in order to refresh the user’s memory regarding the data. However, it is important for the user to know that these commands are not available through the GUI. Instead the commands will be typed in R’s main window. The function `getCaseIds()` will return the case IDs or names assigned to a set of files. If it is necessary to see the case’s name, the function `getCaseNames()` is useful and uses `getCaseIds()` as one of the parameters. `nFiles` will return the number of files that belong to a specific case. Finally, the `getCases()` function retrieves the case names or IDs, depending on the argument `<names>`. Both `getCaseIds()` and `getCases()` utilize the function `getFileIds()` in order to retrieve the names or IDs from a file that is currently in use. Those commands are listed below:

```
# Retrieve the number of cases and the case name
getCaseIds(fid = getFileIds(), nFiles = FALSE)

# Returns the names of the IDs
getCaseNames(caseId = getCaseIds(nFiles = FALSE))

# Returns the case Names or IDs
getCases(fid=getFileIds(), names = TRUE)
```

Figure 3 Demonstrates the output from each of these three commands. The output reveals four participants in this case study of family psychoeducation. These four participants have the case IDs 1-4. Likewise, the names given to these four participants were Participant1 through Participant4.

```
> getCaseIds(fid = getFileIds(), nFiles = FALSE)
[1] 1 2 3 4
attr(,"class")
[1] "RQDA.vector" "caseId"
> getCaseNames(caseId = getCaseIds(nFiles = FALSE))
[1] "Participant1" "Participant2" "Participant3" "Participant4"
attr(,"class")
[1] "RQDA.vector" "caseName"
> getCases(fid=getFileIds(), names = TRUE)
[1] "Participant1" "Participant2" "Participant3" "Participant4"
attr(,"class")
```

Figure 3. getCaseIds(), getCaseNames() and getCases() output

Attributes and Descriptive Information

Under the “Attributes” tab, the researcher can describe the unit of analysis. These can include, for example, the age, socioeconomic status, gender and other variables of the participants. The attributes will depend on the unit of analysis and the purpose of the study. In RQDA it is possible to learn descriptive information about the codes by using the command `summaryCodings()`. This command has to be written in the R command window, and it is not available through the RQDA GUI interface. The `summaryCoding()` function will return the “Number of codings for each code,” “Average number of words associated with each code,” and “Number of files associated with each code” in the R command window. **Figure 4** represents the output from `summaryCodings()`. For example, the theme “Class Mechanics” contains all mentions of how users interact within the online psychoeducation course, while the theme “International” contains the participants’ comments that discuss how the course is viewed and access internationally. In **Figure 4** the theme “Class Mechanics” has four different codes attributed to this theme, while the theme International has two codes.

```

> summaryCodings()
-----
Number of codings for each code.

      ClassMechanics      Curriculum      Experiences      International
              4              10              1              2
      Involved      Limitations      NAMI      nonprofit
              4              3              6              1
      Online      Origin      ProgramGo      recovery
              5              3              3              1
RecoveryOriented      ROLE      Unique
              3              3              1
-----
Average number of characters associated with each code.

      ClassMechanics      Curriculum      Experiences      International
      897.5000      693.3000      2443.0000      519.0000
      Involved      Limitations      NAMI      nonprofit
      521.0000      346.0000      661.0000      1801.0000
      Online      Origin      ProgramGo      recovery
      1178.8000      433.0000      528.3333      542.0000
RecoveryOriented      ROLE      Unique
      433.6667      354.6667      373.0000
-----
Number of files associated with each code.

      ClassMechanics      Curriculum      Experiences      International
              2              3              1              1
      Involved      Limitations      NAMI      nonprofit
              2              2              2              1
      Online      Origin      ProgramGo      recovery
              2              1              3              1
RecoveryOriented      ROLE      Unique
              3              2              1
-----

```

Figure 4. summaryCodings() output

getCodingTable()

The command `getCodingTable()` allows the researcher to have a descriptive look at the data. The output, which can be seen in **Figure 5**, will contain the code (or themes) along with the filename. In the case of this example, the filename also represents the participant interviewed. The row ID, Case ID and File ID will also be provided in this table, along with the code index from beginning to end and the code length.

```

> getCodingTable()
  rowid cid fid      codename      filename index1 index2 CodingLength
1     1   2   4      Origin Participant1  3854  4448      594
2     2   1   4      Curriculum Participant1  3283  3379      96
3     3   2   4      Origin Participant1  4756  5170     414
4     4   3   4      International Participant1  5687  6171     484
5     5   1   4      Curriculum Participant1  6233  6619     386

```

Figure 5. getCodingTable() output

codingByOne()

The codingByOne() function is useful to researchers when searching for a specific code in the data. It is helpful to run getCodingTable() first. For example, in the second line of **Figure 5**, we can see that Case ID (cid) is 1 and the File ID is 4. From **Figure 5** and the execution of getCodingTable() it is clear the code or theme in this location is “curriculum.” In AUTHOR (2016), a recurrent theme was the use of an original curriculum to teach psychoeducation to family members of people facing mental health challenges. If the user executes the following code:

```
getCodingsByOne(cid=1, fid=4, codingTable=c("coding"))
```

This will return a pop-up window with the seven codes marked as “Curriculum” for the first participant. The result can be seen in **Figure 6**. At the top of the window, the information is displayed with the number 7 and file 1. Not all the seven codes are shown.

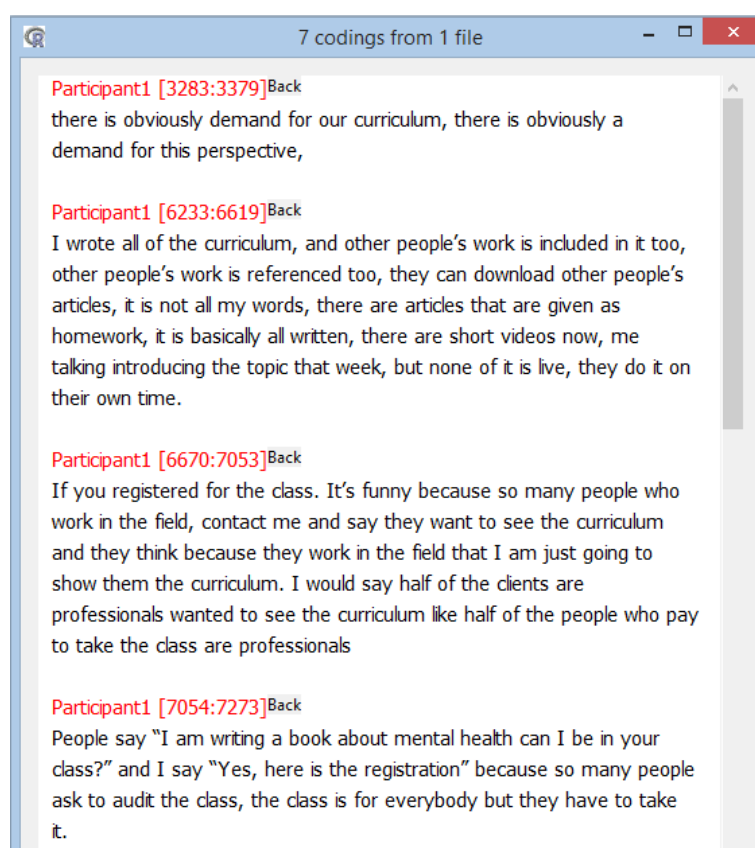


Figure 6. getCodingsByOne() output

codingBySearch()

The codingBySearch() function is helpful to researchers by finding a specific text in a file and then applying a specific coding. **Figure 7** shows the transcript before using the function codingBySearch()

What in your opinion makes FHT different from other organizations that support family members of people facing mental health challenges? The philosophy and approach are unique. Many family support programs focus on psychoeducation related to symptoms, medication and treatment, and often do not include important messages related to hope and recovery. In FHT, multiple perspectives on the causes of mental distress are given as well as a critical perspective on the mental health system. There is an emphasis on recovery and hope, and how families can create an environment to promote recovery. The focus on the family member, their emotions and their well-being is also unique.

Figure 7. Original transcript before codingBySearch()

This code should be typed in the R command window.

```
codingBySearch("recovery", fid=getFileIds(), cid=9, separator=".!?.")
```

The function will search for the word “recovery.” The fid argument will find the file ID. If the user is in need to know what the file ID is he or she can always go to the file tab and select the file of interest. The file ID can be seen on the top in **Figure 8**. This process can be followed to find the code ID. The code ID or cid argument will code the string as “recovery.” “Separator” tells the function to stop at the end of a sentence, which is defined by a “.”, “!” or “?”. **Figure 9** shows the result of using the codingBySearch()function.

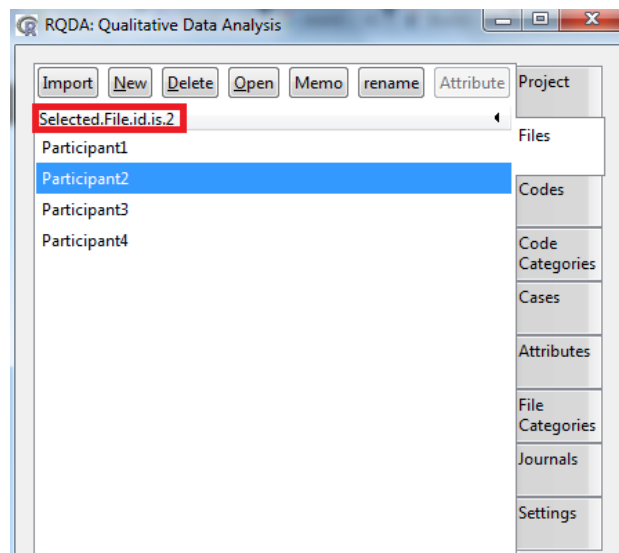


Figure 8. File ID

`<recovery>` The philosophy and approach are unique. Many family support programs focus on psychoeducation related to symptoms, medication and treatment, and often do not include important messages related to hope and recovery. In FHT, multiple perspectives on the causes of

Figure 9. codingBySearch() output

The following code can be run:
`codingBySearch("Curriculum", fid="4", cid="1")`

Interrater Agreement

Reliability in qualitative research is as important as in quantitative research (Campbell, Quincy, Osserman, & Pedersen, 2013). Interrater agreement can be performed by using the `CrossCodes()` function. Two different people would have to code the data. For example, Rater1 would code the data. After Rater1 has finished coding, these codes must be deleted temporarily. Then, Rater2 would code the same file. Next, utilizing the function `undelete()` the researcher can recover the Rater1 codes. Finally, the researcher can use the function `crossCodes()` to check for interrater agreement. This function will return the number of codes that match exactly.

Plot of Categories

In the GUI, the user can select the tab “Code Categories” and select all the codes by pushing CTL + A. This will highlight all the code categories. Then right click the selection and click on “Plot Selected Code Categories.” A new window will pop-up and after a few seconds, a map of the data framework will be plotted. See **Figure 10** to examine a visual graphic of the themes. This is a simple example for demonstration purposes; however, RQDA is able to plot more complex networks. In **Figure 10**, shows the subthemes “Origin,” “Online Format,” “Need for Recovery Oriented Class” and “National Alliance on Mental Illness (NAMI) limitations,” all cited within the overarching theme of the “Need for the Organization.”

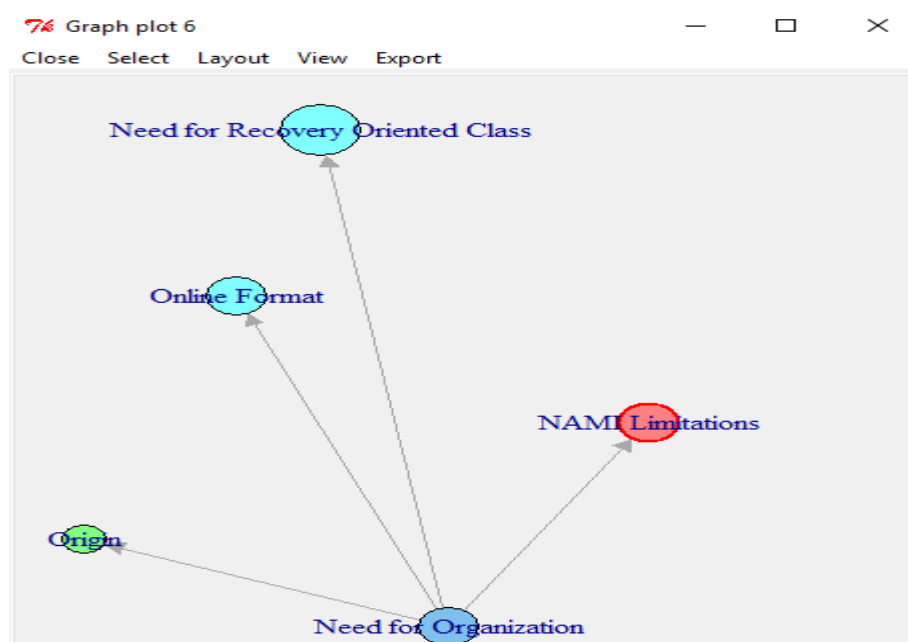


Figure 10. Themes visualization.

It is possible to change the theme vertex color and size by right clicking on the vertex. Once the plot is final, the user is able to save the image to the computer using the Export menu. The file will be saved in a .eps format, which can be used in Adobe Illustrator.

Saving the Project

Once a project is created in RQDA, a file with the extension .rqda, will be created in the working directory. However, it is also possible to export the coded file into an HTML format. The function `exportCodedFile()` will export the coded file into an HTML file that will contain the codes and labels created by the user. The following syntax can be used to create this HTML file:

```
exportCodedFile("fileExport.html", fid= getFileIds(), closeAfter = TRUE)
```

As with other languages, the file path must be inside quotations “ ”. The fid command specifies the file ID, and `closeAfter= TRUE` will close the file widget after the export is completed.

The HTML file will be saved under the working directory, in this case under the name `fileExport.html`. In order to open the file, a browser must be selected. The final product can be seen in **Figure 11**.

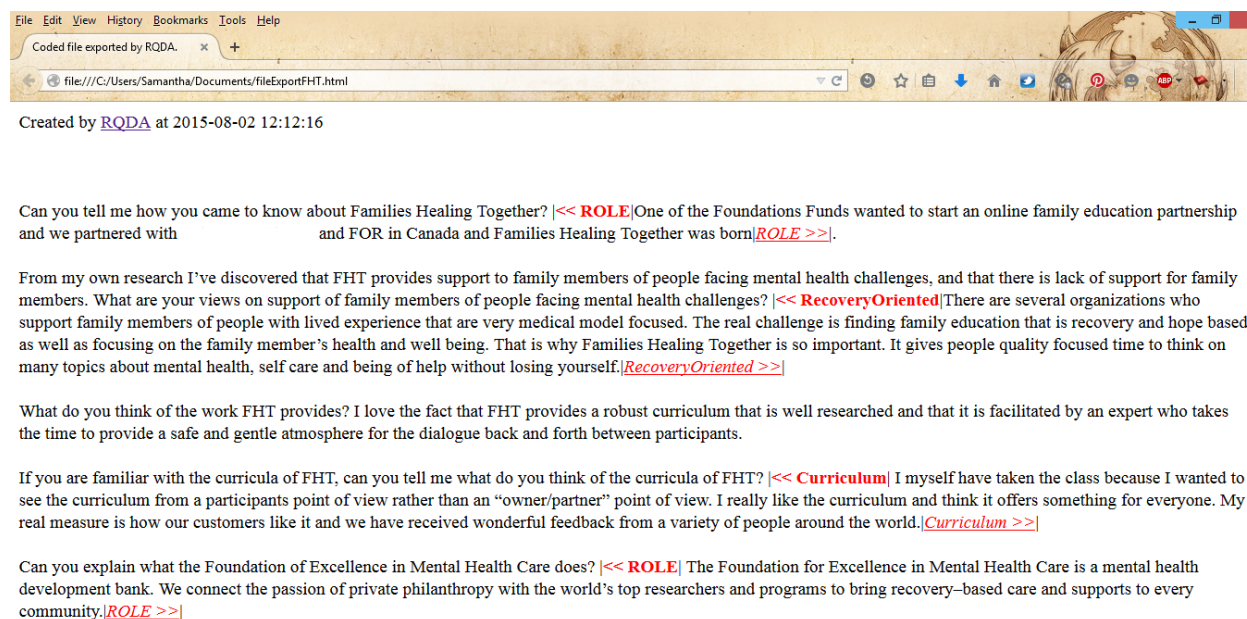


Figure 11. HTML output preview

Exporting

It is also possible to save the coded file as an HTML file. This file will show all the codings or entries under a particular code. The following code can be used to create the HTML file:

```
exportCodings(file="Recovery.html", Fid=1, order="fname", append=FALSE,
codingTable="coding")
```

This code will collect the codings from the file ID number 1. However, it is important to note that R is case sensitive, and the code must be submitted as specified. For example, file ID should be capitalized. The codingTable argument specifies data table where codings are stored. Normally, this data table is named either coding or coding2. Once the code is executed, a GUI window will pop up. This window will contain all the themes created by the user. **Figure 12** shows the GUI window.

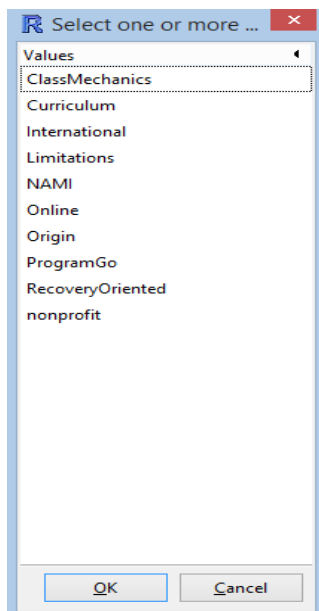


Figure 12. Export window

Utilizing this window, the researcher can highlight the themes that he or she is interested in (or even all the codes) by holding the Control key and clicking on each code individually. The resulting HTML file can be seen in **Figure 13**. In this example, the selected theme is “Curriculum” codes from the first participant.

Created by [RQDA](#) at 2016-05-05 19:28:16

[Curriculum](#)

7 Codings of "Curriculum" from 1 file.

Participant1 [3283: 3379]

there is obviously demand for our curriculum, there is obviously a demand for this perspective.
[Back](#)

Participant1 [6233: 6619]

I wrote all of the curriculum, and other people's work is included in it too. other people's work is referenced too, they can download other people's articles, it is not all my words, there are articles that are given as homework, it is basically all written. there are short videos now, me talking introducing the topic that week, but none of it is live, they do it on their own time.
[Back](#)

Participant1 [6670: 7053]

If you registered for the class. It's funny because so many people who work in the field, contact me and say they want to see the curriculum and they think because they work in the field that I am just going to show them the curriculum. I would say half of the clients are professionals wanted to see the curriculum like half of the people who pay to take the class are professionals
[Back](#)

Participant1 [7054: 7273]

People say "I am writing a book about mental health can I be in your class?" and I say "Yes, here is the registration" because so many people ask to audit the class, the class is for everybody but they have to take it.
[Back](#)

Participant1 [8323:10137]

There are two that have been written, recovering our families class is rooted in 10 years of my career as a family counselor specifically in mental health, my career has always been incredible niche which is why I think the curriculum is so good, it is like 10 years of my work as well as the work that happen before I even arrived at that organization so it is very well honed, and it is also that curriculum is well honed because we used to use that curriculum in live groups, so there was a lot of testing that happen about what kinds of things were good for people. what did people

Figure 13. HTML export file.

Word Clouds

It is also possible to visualize qualitative data by using the text mining R package `tm` by Feinerer and Hornik (2015). The package can be installed by following the steps at the beginning of this article, but substituting `tm` for `RQDA`. Once the package is installed, the function `wordcloud()` can be used to create a colorful word cloud. In a word cloud, the size of the text represents the frequency of the word used in the transcript.

In order to load the text to R, the user may use a simple/copy pasting or the “corpus” function from the `tm` package. A corpus is considered a compilation of documents, for example, in the example worked in this paper the compilation of four interviews in four different text files. Note that the path does not direct to a specific file; thus, the user must be careful on what it is stored in the specified directory, or all files contained within the folder will be loaded.

```
yourPath <- DirSource("C:/Documents/Case Study/")
recoveryWords <- Corpus(yourPath)
```

If the user wishes to examine what has just been imported into R, the commands “inspect” or “summary” can be used, for example `inspect(recoveryWords)`. Next, the function `tm_map()` is useful in other to remove unnecessary spaces and remove stopwords such as “the.” Note that the package provides options for these stop words. In the example, the option “SMART” is used. “SMART” is a list of stopwords in English. More information on the package can be found in the documentation in the R website. However, “English” is also an option, as well as other languages such as German and Romanian. Within the `tm` package it is also possible to edit the text before creating the word cloud. Here are some helpful commands:

```
recoveryWords <- tm_map(recoveryWords, stripWhitespace)
recoveryWords <- tm_map(recoveryWords, removeWords,
stopwords("SMART"))
recoveryWords <- tm_map(recoveryWords, tolower)
```

Finally, to create the word cloud, the command `wordcloud(recoveryWords)` can be used. The argument `<colors>` in this function can be used to change the colors of the wordcloud. Furthermore, the frequency of the words can be edited; for example, the arguments `<min.freq>` and `<max.words>` allow the user to determine a minimum and a maximum number for words to appear in the word cloud. **Figure 14** shows the result of the word cloud.

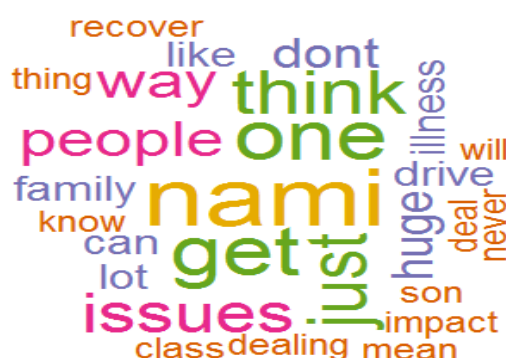


Figure 14. Themes word cloud

Conclusion

Thematic analysis is one of the most flexible tools in qualitative methodology and thus the basis of many more sophisticated qualitative approaches. RQDA offers students and evaluators alike the opportunity to utilize qualitative software in their analyses. In combination with additional R packages, R can help researchers, evaluators and students perform qualitative research without having to pay for what is almost always an expensive software license. Additionally, support for R, RQDA and other R packages is available online without cost.

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Author Note

Samantha Estrada is a graduate student at the University of Northern Colorado and adjunct faculty at AIMS Community College. Correspondence regarding this article can be addressed directly to: samantha.estrada@unco.edu.

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Article Citation

Estrada, S. (2017). Qualitative analysis using R: A free analytic tool. *The Qualitative Report*, 22(4), 956-968. Retrieved from <http://nsuworks.nova.edu/tqr/vol22/iss4/3>
