RQDA
Qualitative Data Analysis

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1. Introduction

The r-project text is a free software environment for statistical computing and graphics. It has is a network of ftp and web servers around the world that store identical, up-to-date, versions of code and documentation for R called the Comprehensive R Archive Network (CRAN). One of the packages R Qualitative Data Analysis (RQDA) is a free software for qualitative text and PDF document analysis.

It is particularly useful for inductive thematic analysis however for deductive analysis it is necessary to upload Categories and Codes one by one. RQDA Code Builder resolves this.

This document demonstrates how to use **RQDA()** and the **RQDA Code Builder** on a GNU/Linux platform. **R** and **RQDA()** can be used on other platforms like Microsoft Windows and as the RQDA Code Builder is Python3 based it can easily be adapted for other platform implementations.

It will be necessary to have python3 installed on the platform. Use the *Software Manager* for your GNU/Linux flavour or install using *apt* from the shell.

```
$ sudo apt install python3
$ sudo apt-get install python-yaml
```

Confirm the install and the version of *python3*.

```
$ python3 --version
Python 3.5.2
```

1.1 Qualitative Content Analysis

Qualitative Content Analysis follows a procedure.

1. Deciding the research question
2. Selecting material
3. Building a coding frame
4. Segmentation
5. Trial coding
6. Evaluating and modifying the coding frame
7. Main analysis
8. Presenting and interpreting the findings.

Uwe Flick. An Introduction to Qualitative Research. 5th Edition. ISBN: 1446297721, 9781446297728. SAGE, 2014.

1.2 Coding

Assuming that steps 1 and 2 are completed and the next step is the building of a coding frame. There are two approaches, inductive and deductive.

The inductive approach has codes extracted directly from the source data. As the researcher reads through each source file (interviews, papers, etc..), he or she highlights key lines and creates a code for it. These codes are added and modified as the researcher reads through all the source material. The codes are then bundled into codes of common category. RDQA() is very suitable for this approach.

The deductive approach involves the researcher developing codes and categories in advance, in a scheme. These codes are then applied to the source data. As RDQA() expects codes to be added one by one through the graphical interface this is difficult. Application of the **rqda_code_builder.py** program described here helps to fix this.

2. Using RDQA()

2.1 Starting RQDA()

Create a directory as a parent for the project and open a command shell in it. Within the parent directory create a *Sources* directory. Place the source files in the *Sources* directory. In this example you can see two source files but typically this would be many files associated with interviews, observation logs, etc..

```
$ mkdir Sources
```

Illustration 1: base directory containing Sources

```
$ ls Sources
Colours_of_Health_and_Sickness_Sociocult.txt
Psychological_Properties_Of_Colours.txt
```

Run the 'R' program.

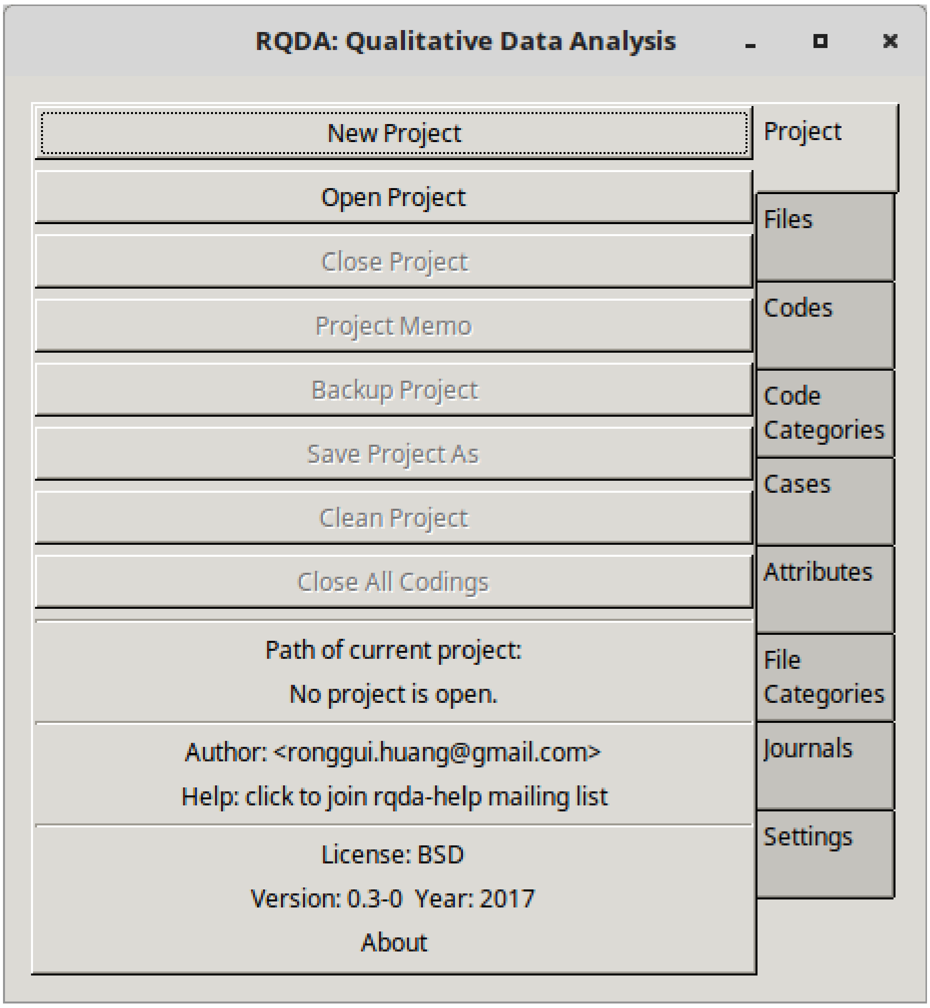
```
$ R

R version 3.4.4 (2018-03-15) -- "Someone to Lean On"
Copyright (C) 2018 The R Foundation for Statistical Computing
Platform: x86_64-pc-linux-gnu (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

  Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

>
```

2.1.1 Add the RQDA library

Add the *RDQA() library*, this is the program that will allow for the analysis of the data.

```
> library(RQDA)
Loading required package: RSQLite
Loading required package: gWidgetsRGtk2
Loading required package: RGtk2
Loading required package: gWidgets
Loading required package: cairoDevice
Loading required package: DBI

Use 'RQDA()' to start the programme.
```

The graphical tool starts.



Path of current project:
No project is open.

Author: <ronggui.huang@gmail.com>
Help: click to join rqda-help mailing list

License: BSD
Version: 0.3-0 Year: 2017
About

Illustration 2: RQDA Graphical User Interface

2.1.2 Create a Project

In the GUI:

Click **New Project**. Enter a name in the desired path: **Colour_project.rqda**. Click **OK**. A new project file appears in the directory.

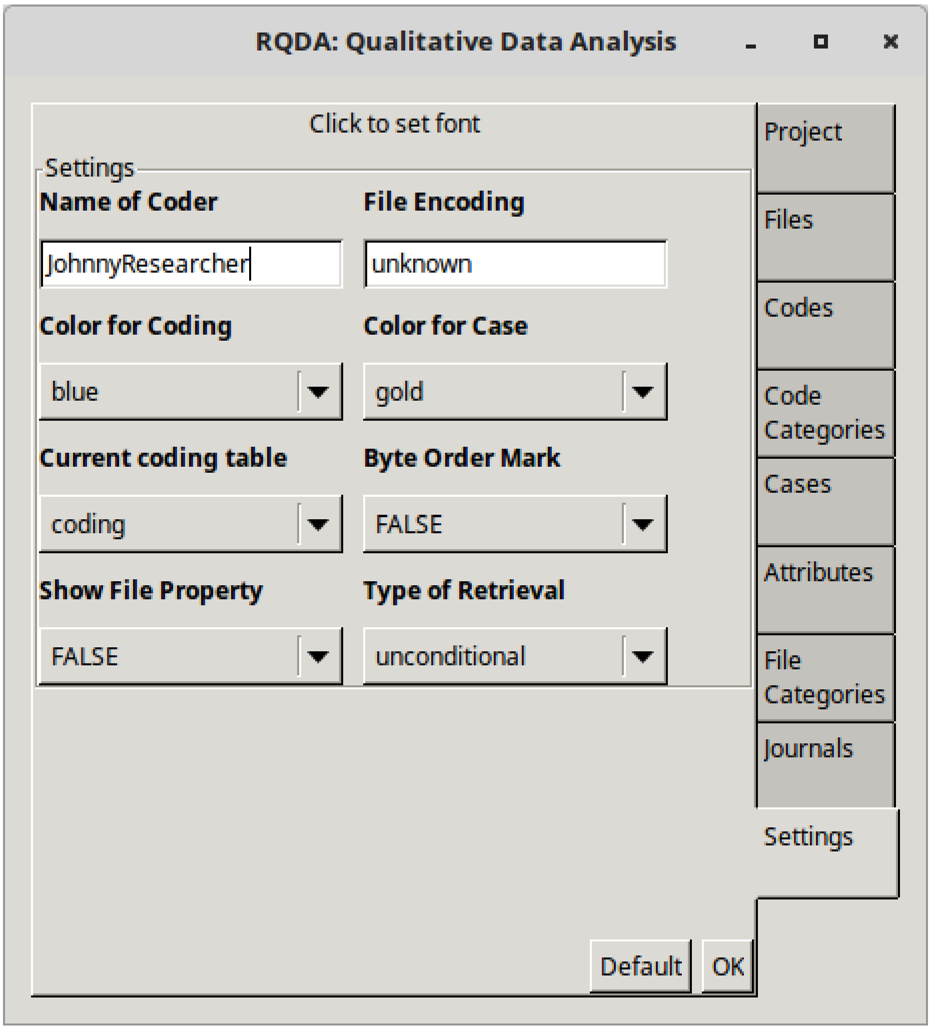
Illustration 3: New project

You may also notice in the R shell that the following command is executed.

```
> [1] "~/Colour_project.rqda"
```

2.1.2.1 Name the coder

Select the **Settings** tab and define the **Name of Coder** in the first box.



Name of Coder: JohnnyResearcher
File Encoding: unknown
Color for Coding: blue
Color for Case: gold
Current coding table: coding
Byte Order Mark: FALSE
Show File Property: FALSE
Type of Retrieval: unconditional

Illustration 4: Settings: Name of Coder

2.1.3 Import source files to the project

The next step is to import source data. This can be achieved either through the GUI one by one in bulk using the R function **write.FileList()** in the 'R' shell.

2.1.3.1 Using the GUI

To use the GUI, select the **Files** tab followed by the **Import** button. Browse to each file in turn and select.

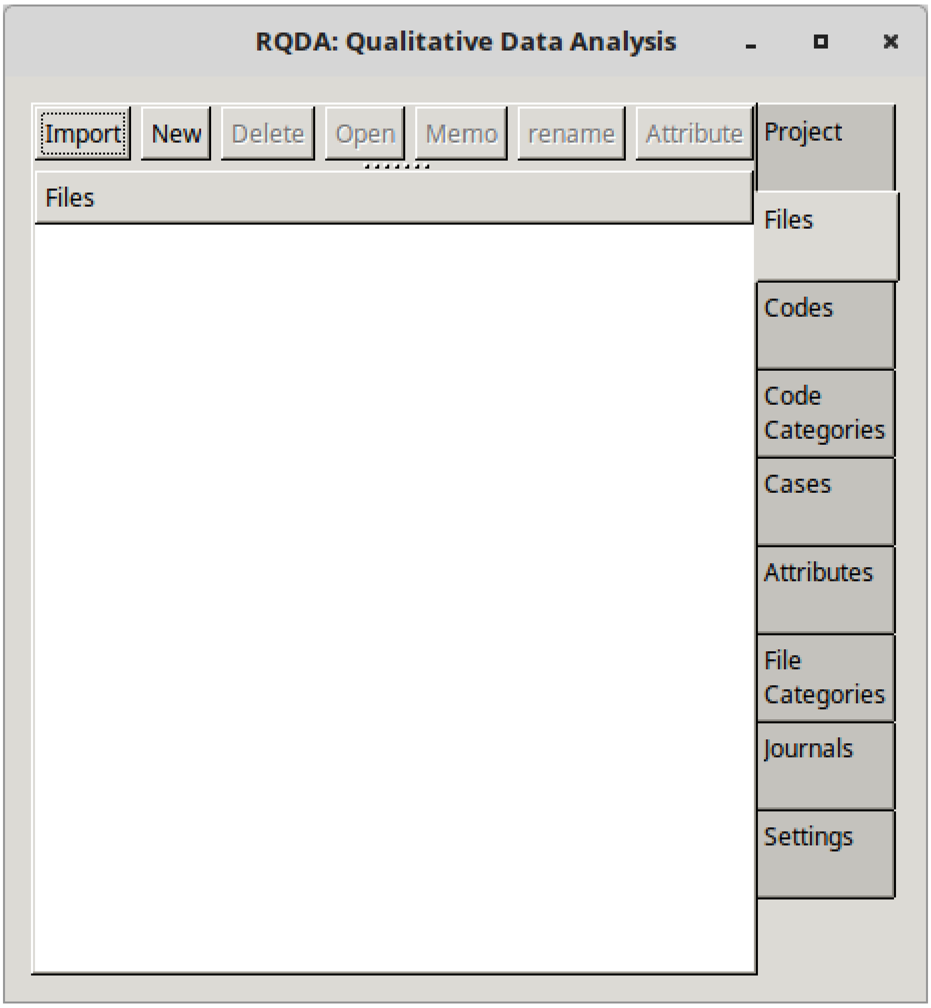


Illustration 5: Files: Import

2.1.3.2 Using the R shell

An alternative mechanism is to use the **R** shell. This command using the **addFilesFromDir()** function selects the files in the **Sources** directory that match the pattern. In this case all files that end in the pattern **.txt**. Execute the command:

```
> addFilesFromDir('Sources', pattern = "*.txt$")
```

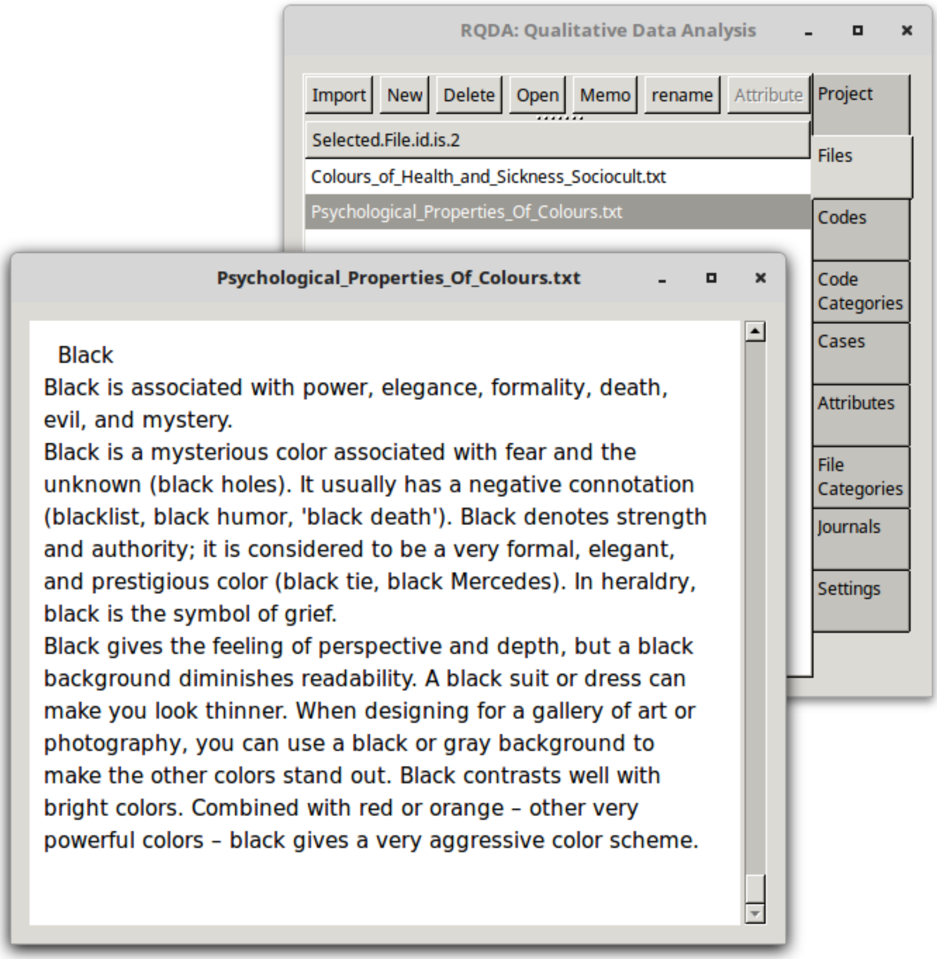
If you now check the GUI by clicking the **Files** tab, you will notice that the files from the **Sources** directory have been imported. Alternatively use the **getFiles()** function in the **R** shell to confirm.

```
> getFiles()
[1] "Colours_of_Health_and_Sickness_Sociocult.txt"
[2] "Psychological_Properties_Of_Colours.txt"
attr(,"class")
[1] "RQDA.vector" "fileName"
```

2.2 Coding

2.2.1 Inductive approach

RQDA() is very suitable for the **inductive approach** however it takes significant time.



Selected.File.id.is.2

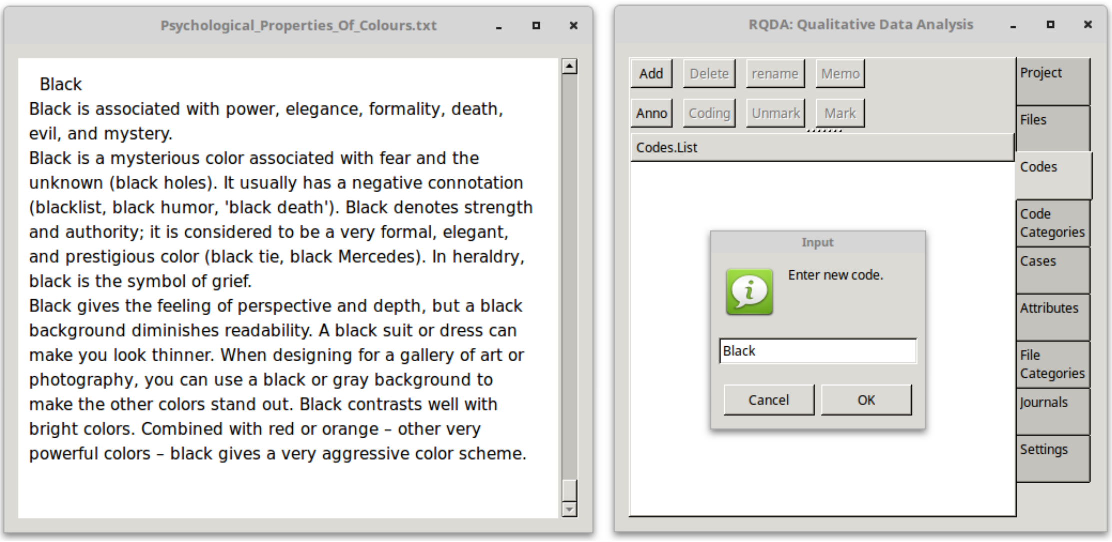
Colours_of_Health_and_Sickness_Sociocult.txt

Psychological_Properties_Of_Colours.txt

Black
Black is associated with power, elegance, formality, death, evil, and mystery.
Black is a mysterious color associated with fear and the unknown (black holes). It usually has a negative connotation (blacklist, black humor, 'black death'). Black denotes strength and authority; it is considered to be a very formal, elegant, and prestigious color (black tie, black Mercedes). In heraldry, black is the symbol of grief.
Black gives the feeling of perspective and depth, but a black background diminishes readability. A black suit or dress can make you look thinner. When designing for a gallery of art or photography, you can use a black or gray background to make the other colors stand out. Black contrasts well with bright colors. Combined with red or orange – other very powerful colors – black gives a very aggressive color scheme.

Illustration 6: Files: Coding pop-up window

Select each document in turn from the **Files** tab, a pop-up appears with the text from the source file selected.

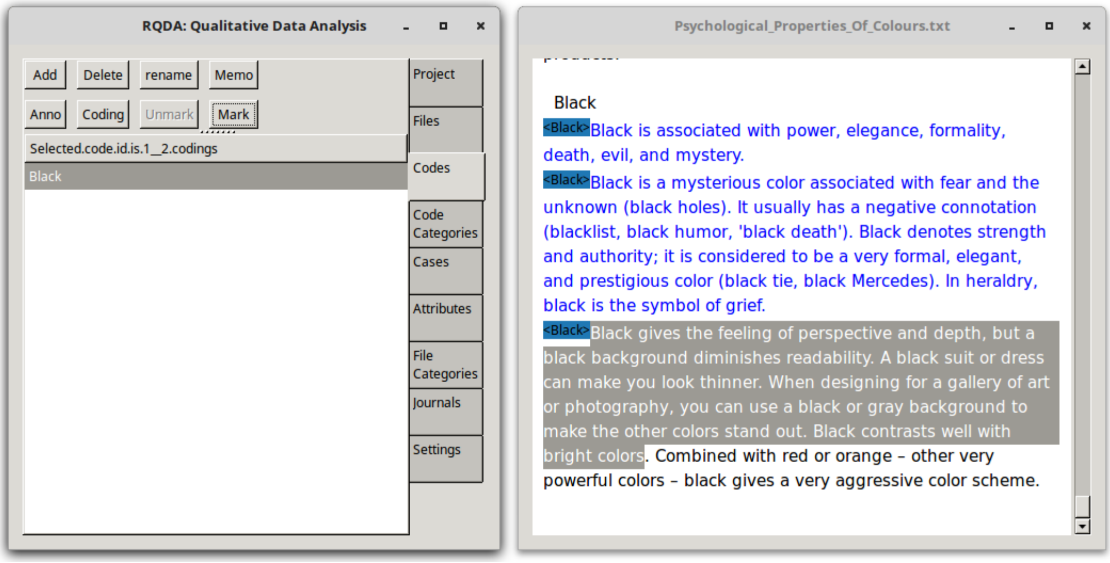


Black
Black is associated with power, elegance, formality, death, evil, and mystery.
Black is a mysterious color associated with fear and the unknown (black holes). It usually has a negative connotation (blacklist, black humor, 'black death'). Black denotes strength and authority; it is considered to be a very formal, elegant, and prestigious color (black tie, black Mercedes). In heraldry, black is the symbol of grief.
Black gives the feeling of perspective and depth, but a black background diminishes readability. A black suit or dress can make you look thinner. When designing for a gallery of art or photography, you can use a black or gray background to make the other colors stand out. Black contrasts well with bright colors. Combined with red or orange – other very powerful colors – black gives a very aggressive color scheme.

Enter new code.
Black

Illustration 7: Codes: Adding new codes

On the main GUI click on the **Codes** tab and as a line is read that requires coding select **Add** and create the code. For example, to add a code **Black**, click **Add**, Enter the new code in the box provided and click **OK**. With text highlighted, select the appropriate code, i.e. **Black** and click **Mark**.



Selected.code.id.is.1__2.codings
Black

Black
<Black>Black is associated with power, elegance, formality, death, evil, and mystery.
<Black>Black is a mysterious color associated with fear and the unknown (black holes). It usually has a negative connotation (blacklist, black humor, 'black death'). Black denotes strength and authority; it is considered to be a very formal, elegant, and prestigious color (black tie, black Mercedes). In heraldry, black is the symbol of grief.
<Black>Black gives the feeling of perspective and depth, but a black background diminishes readability. A black suit or dress can make you look thinner. When designing for a gallery of art or photography, you can use a black or gray background to make the other colors stand out. Black contrasts well with bright colors. Combined with red or orange – other very powerful colors – black gives a very aggressive color scheme.

Illustration 8: Coding source files

As can be seen each line is tagged.

2.2.2 Deductive approach

Unfortunately there does not appear to be a mechanism to import codes into the *RQDA() database* in bulk. For the *deductive approach* a researcher may have tens or even hundreds of categories and codes, it could be necessary to bulk upload. Extract the files from the *RQDA-Code-Builder.tgz* which will give all the files including the database from this example as well as the *rqda_code_builder.py*. Move this file to the parent directory of your *Sources* directory.

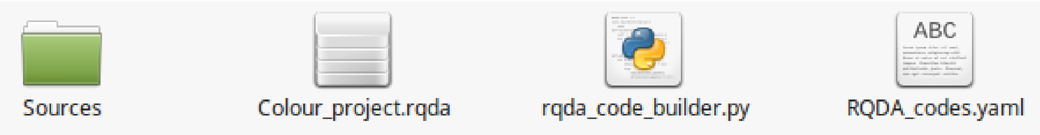


Illustration 9: RQDA Code Builder and RQDA Codes YAML files

The RQDA Code Builder (**rqda_code_builder.py**) program resolves this.

2.2.2.1 YAML file

YAML Ain't Markup Language (YAML) is a human-readable data serialisation language that is commonly used for configuration files, but can be used in many applications where data is being stored or transmitted. It is an ideal format for mapping of categories and codes.

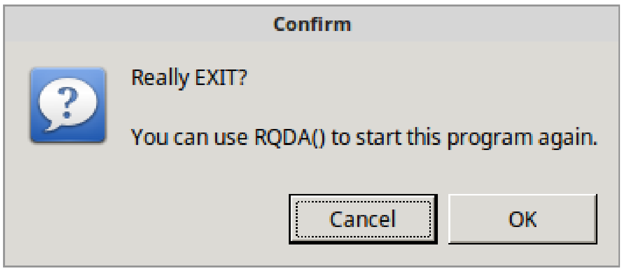
The example project demonstrates how to *deduct* the following code schema as a YAML file in the same directory:

```
$ cat RQDA_codes.yaml
RQDA_codes.yaml
---

Colour:
 -  'Red'
 -  'Green'
 -  'Yellow'
 -  'Grey'
 -  'Black'
 -  'White'
 -  'Black'
 -  'Blue'
 -  'Pink'
 -  'Brown'
 -  'Purple'

Psychological Properties:
 -  'Physical'
 -  'Intellectual'
 -  'Emotional'
 -  'Balance'
 -  'Spiritual'
```

```
    Floral Metaphors:
     -   'Daisy'
     -   'Juicy'
     -   'Apple'
     -   'Berry'
     -   'Flower'
     -   'Peach'

    Human Characteristics:
     -   'Divinity'
     -   'Eternity'
     -   'Infinity'
```

2.2.2.2 Executing the RQDA Code Builder

Before executing the RQDA Code Builder it is important to shut down the *RQDA() application* by clicking on the **X** in the top right corner and selecting **OK** to the **Really EXIT?** question.



Really EXIT?

You can use RQDA() to start this program again.

Illustration 10: Exit RQDA()

The file that the *RQDA() program* uses to store data is an SQLite database. It is the file that was created at the beginning when the project was opened (**Colour_project.rqda**). The RQDA Code Builder reads the YAML formatted schema and uploads it to the database. It also creates a Structured Query Language (SQL) log of each SQL command it executes and more importantly develops a set of **R** commands that match text blocks to the codes. It has the following switches:

```
-c|--coder [Name]  - Define coder, must match that from RQDA() settings.
-d|--database [DB] -  Define path to SQLite3 database file.
-y|--yaml [YAML]   -  Define path to YAML code file.
```

Execute the command, check it is version 1.2 of greater and execute with the relevant switches as demonstrated.

```
$ cat rqda_code_builder.py | grep '# Version' | awk {'print $4'}
1.4

$ ./rqda_code_builder.py -c JohnnyResearcher -d Colour_project.rqda
  -y RQDA_codes.yaml

 RQDA Code Builder
 -----------------

 Connecting to the SQLite3 database Colour_project.rqda.
 Connected to the SQLite3 database Colour_project.rqda. Uploading..

 Upload completed
 ----------------

 A full list of SDL commands executed can be seen in the
 'RQDA_SQL.log' file.

 You can restart the RQDA() library with the following command in
 the R shell:

 > RQDA()
```

Restart **RQDA()** as instructed.

```
 > RQDA()
```

Two new file are created, **RQDA_SQL.log** which is a log of the SQL commands executed on the database as well as **RQDA_R_search_cmds.R** which is a list of commands that will be executed in the **R** shell to apply the deductive codes to the source files.

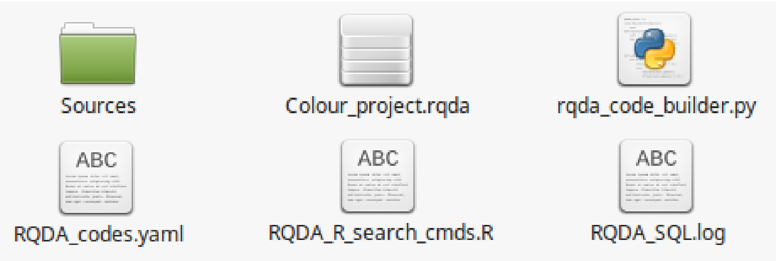


Illustration 11: RQDA SQL log and RQDA R Search Command files

2.2.2.3 Applying the RQDA 'R' search commands

To apply the RQDA search commands execute the following command in the **R** shell. This bulk executes the commands in the **RQDA_R_search_cmds.R** file on all the source files.

```
> source('RQDA_R_search_cmds.R')
```

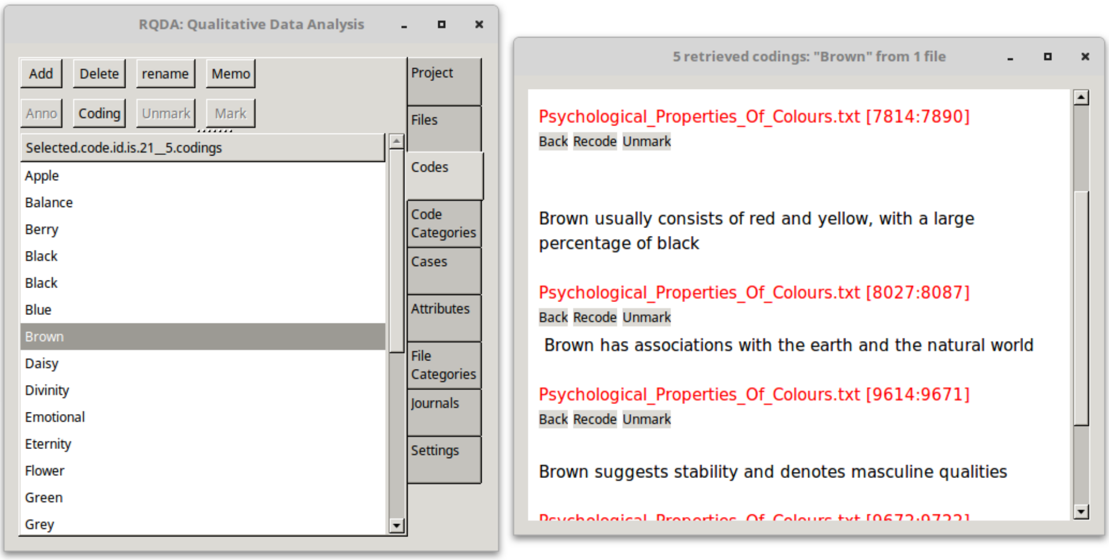
2.3 Reviewing Coding

Before diving into the coding within the various source files, review the coding statistics. It can be seen from this extract that 385 code blocks were applied to the source texts.

```
> getCodingTable()
    rowid cid fid     codename                                     filename
1       4   1   2     Physical      Psychological_Properties_Of_Colours.txt
2       5   1   2     Physical      Psychological_Properties_Of_Colours.txt
3       6   1   2     Physical      Psychological_Properties_Of_Colours.txt
4       7   1   2     Physical      Psychological_Properties_Of_Colours.txt
5       8   1   2     Physical      Psychological_Properties_Of_Colours.txt
6       9   1   2     Physical      Psychological_Properties_Of_Colours.txt

...   ...  ..   .    ...       ...

378   381  22   2       Purple      Psychological_Properties_Of_Colours.txt
379   382  22   2       Purple      Psychological_Properties_Of_Colours.txt
380   383  23   1     Divinity Colours_of_Health_and_Sickness_Sociocult.txt
381   384  23   1     Divinity Colours_of_Health_and_Sickness_Sociocult.txt
382   385  24   1     Eternity Colours_of_Health_and_Sickness_Sociocult.txt
383   386  24   1     Eternity Colours_of_Health_and_Sickness_Sociocult.txt
384   387  25   1     Infinity Colours_of_Health_and_Sickness_Sociocult.txt
385   388  25   1     Infinity Colours_of_Health_and_Sickness_Sociocult.txt
    index1 index2 CodingLength
1      399    534          135
2     4109   4197           88
3     4739   4842          103
4      848    977          129
5     1454   1587          133
6     4257   4394          137

...   ...     ...          ...

378  15568  15620           52
379  15621  15663           42
380   3189   3301          112
381  15902  16020          118
382   3189   3301          112
383  15902  16020          118
384   3189   3301          112
385  15902  16020          118
```

2.4 Reviewing the coded blocks

Selecting the **Codes** tab from the **RQDA()** GUI and select any particular code. In this case **Brown** was selected. Click on the **Coding** button and a pop-up appears with each instance of sentences within the source files where the word **Brown** or **brown** appeared, such sentences were tagged with the **Brown** tag. The pop-up also shows for each block the source file from where the sentence appeared.



Psychological_Properties_Of_Colours.txt [7814:7890]

Brown usually consists of red and yellow, with a large percentage of black

Psychological_Properties_Of_Colours.txt [8027:8087]

Brown has associations with the earth and the natural world

Psychological_Properties_Of_Colours.txt [9614:9671]

Brown suggests stability and denotes masculine qualities

Illustration 12: Extracting coded sentences by code

This performs an initial *deductive coding*. There may be quirks however, what if one interviewee kept referring to **Beige** but the researcher wanted to code it as **Brown**? or the researcher has a code **Colour** and some of the transcripts were transcribed in American English. In this case sentences with **Color** should be coded with **Colour**.

Carry out additional coding of sentences like this.

First find the **CID** of the **Code** for **Brown**. Select the **Codes** tab, click on the **Brown** code and its **CID** can be seen at the top of the pane as shown by the red circle in the diagram.

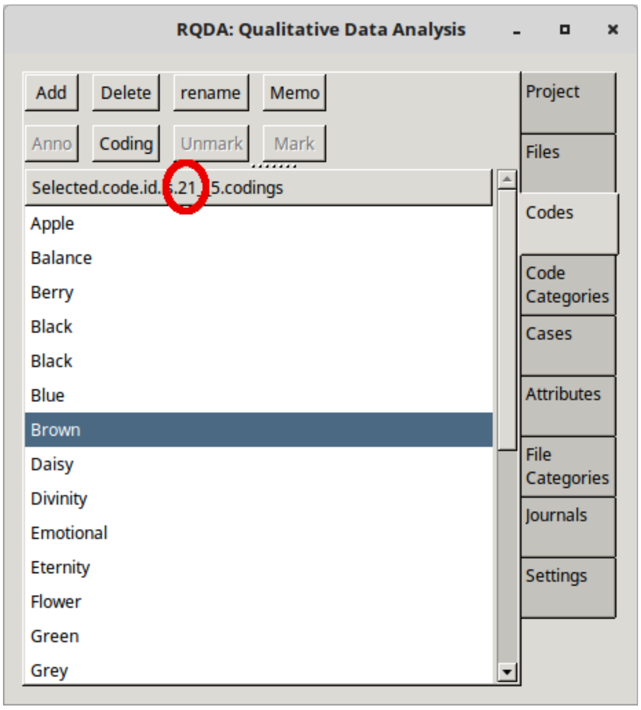


Illustration 13: Extracting the Code ID (CID)

Execute the following two lines in the **R** shell and they will be added to the main coding already performed.

```
> codingBySearch("Beige",fid=getFileIds(),cid=21,seperator="[.!?]")
> codingBySearch("beige",fid=getFileIds(),cid=21,seperator="[.!?]")
```

2.5 Visualising categories

There are some tools built into **RQDA()** for visualisation. For example using the **D3.js JavaScript library** for manipulating data. **D3** helps bring data to life visually using Hypertext Markup Language (HTML), Scalable Vector Graphics (SVG), and Cascading Style Sheets (CSS).

2.5.1 Installing d3Network

On the **R** Shell install D3.js and activate the **d3Network** within **R**.

```
> install.packages('d3Network')
> library(d3Network)
```

2.5.2 Visualising Categories

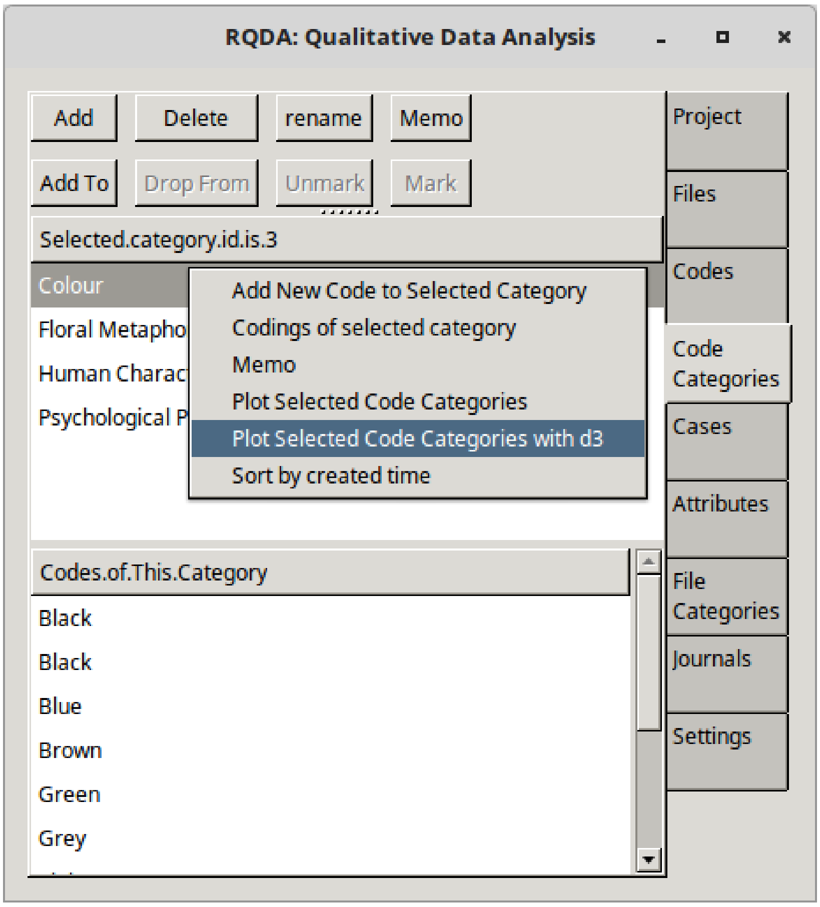


Illustration 14: Using D3.js visualisation

Select the **Categories** tab, highlight a **Category** or many **Categories** using the **ctrl** button and right click. Scroll down to the **Plot selected code categories with d3**. A HTML page will pop-up with diagrams like these:

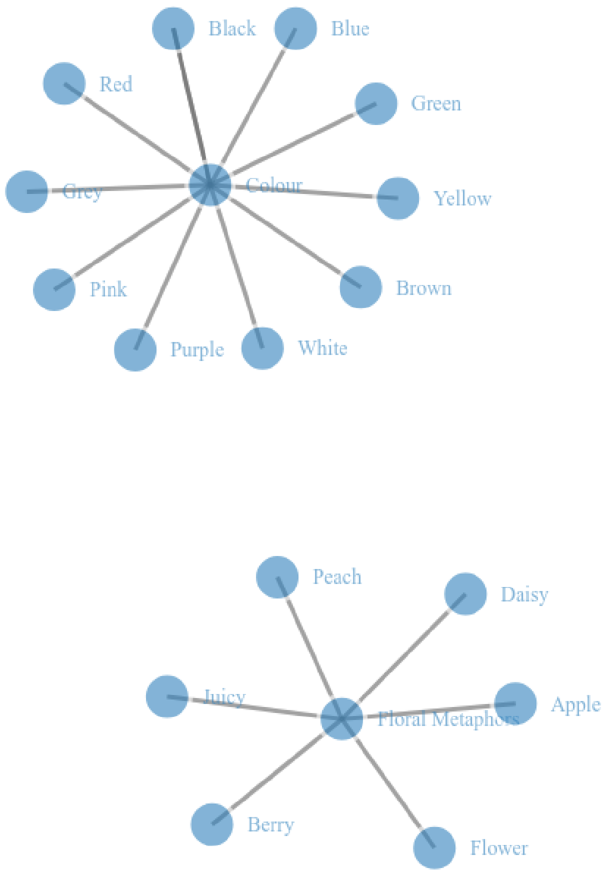


Illustration 15: D3.js visualisation by Category

2.6 Summary

There are a lot more features to **R** and **RQDA()** that can aid qualitative research. The additional **RQDA Code Builder** program (**rqda_code_builder.py**) allows the researcher to deductively pre-build a code schema and apply it automatically.

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