The `openxlsx2` book

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Preface

This is a work in progress book describing the features of `openxlsx2` (Barbone and Garbuszus 2023). Having written a book before, I never imagined to do this again and therefore I shall not do it. But still I consider it a nice addition to have something more flexible as our `vignettes`.

1 Introduction

Unfortunately the entire business world is still built almost entirely on Microsofts Office tools and whenever data is involved, this means that is is largely built on the spreadsheet software Excel. R users that want to interact with this previously closed source file format had to rely on various packages. Packages that create workbook objects like `xlsx` (Dragulescu and Arendt 2023) and `openxlsx` (Schauberger and Walker 2023) and packages for special tasks namely`*readxl` (Wickham and Bryan 2023) and `writexl` (Ooms 2023), some are Windows exclusive interacting with Excel via a DCOM server `RDCOMClient` and `RExcel` [1].

In Excel 2007 a new open standard called OOXML(short for office open xml)[2] which we will refer to as *openxml* was introduced. In December 2006 this standard was accepted by the ECMA and it subsequently replaced the previously used `xls` files wherever people are working with spreadsheet software (after all we are all aware that accounting does not really care whatever file format they are using as long as it opens up in their favorite spreadsheet software). The openxml standard introduced the so called Excel 2007 workbook format `xlsx`. These files are a collection of zipped XML-files. This makes is easy to import the files to R, because all you need is a tool to unzip the files and an XML-parser to import the files as data frames. Still, since there are various tasks available to interact with spreadsheet file, there are also various tools required. If all you want to do is read from files `readxl` is probably enough, if all you want to do is write xlsx files `writexl` is probably the fastest choice available. Yet there are a plethora of other tasks available and this book is about them.

The predecessor to `openxlsx2` (Barbone and Garbuszus 2023) called `openxlsx` (originally founded by Andrew Walker) was inspired by the `rJava` based `xlsx` package, but dropped the `rJava` dependency, and the support for the old `xls` files and wrote a custom XML parser in `Rcpp` (Eddelbuettel and François 2011). Later Phillip Schauberger picked up the abandoned `openxlsx` package and continues to maintain it. Finally `openxlsx2` was forked from `openxlsx` to include (1) the `pugixml` (Kapoulkine 2006-2022) library to address shortcomings of the `openxlsx` XML parser and (2) to switch to the `R6` (Chang 2021) package to introduce modern programming flows. Since then `openxlsx2` has evolved a lot, includes many new features and is approaching a stable API release `1.0`. This manual is supposed to bundle and extend the existing vignettes and to document the changes.

[1] See https://github.com/omegahat/RDCOMClient.
[2] See https://wikipedia.org/wiki/Office_Open_XML.

1.1 Installation

You can install the stable version of `openxlsx2` with:

```
install.packages('openxlsx2')
```

You can install the development version of `openxlsx2` from GitHub with:

```
# install.packages("remotes")
remotes::install_github("JanMarvin/openxlsx2")
```

Or from r-universe with:

```
# Enable repository from janmarvin
options(repos = c(
  janmarvin = 'https://janmarvin.r-universe.dev',
  CRAN = 'https://cloud.r-project.org'))
# Download and install openxlsx2 in R
install.packages('openxlsx2')
```

1.2 Working with the package

We offer two different variants how to work with `openxlsx2`.

- The first one is to simply work with R objects. It is possible to read (`read_xlsx()`) and write (`write_xlsx()`) data from and to files. We offer a number of options in the commands to support various features of the openxml format, including reading and writing named ranges and tables. Furthermore, there are several ways to read certain information of an openxml spreadsheet without having opened it in a spreadsheet software before, e.g. to get the contained sheet names or tables.
- As a second variant `openxlsx2` offers the work with so called `wbWorkbook` objects. Here an openxml file is read into a corresponding `wbWorkbook` object (`wb_load()`) or a new one is created (`wb_workbook()`). Afterwards the object can be further modified using various functions. For example, worksheets can be added or removed, the layout of cells or entire worksheets can be changed, and cells can be modified (overwritten or rewritten). Afterwards the `wbWorkbook` objects can be written as openxml files and processed by suitable spreadsheet software.

1.3 Example

This is a basic example which shows you how to solve a common problem:

```
library(openxlsx2)
# read xlsx or xlsm files
path <- system.file("extdata/openxlsx2_example.xlsx", package = "openxlsx2")
read_xlsx(path)
```

```
    Var1 Var2 NA  Var3  Var4       Var5         Var6    Var7     Var8
3   TRUE    1 NA     1     a 2023-05-29 3209324 This #DIV/0! 01:27:15
4   TRUE   NA NA #NUM!     b 2023-05-23         <NA>       0 14:02:57
5   TRUE    2 NA  1.34     c 2023-02-01         <NA> #VALUE! 23:01:02
6  FALSE    2 NA  <NA> #NUM!       <NA>         <NA>       2 17:24:53
7  FALSE    3 NA  1.56     e       <NA>         <NA>    <NA>     <NA>
8  FALSE    1 NA   1.7     f 2023-03-02         <NA>     2.7 08:45:58
9     NA   NA NA  <NA>  <NA>       <NA>         <NA>    <NA>     <NA>
10 FALSE    2 NA    23     h 2023-12-24         <NA>      25     <NA>
11 FALSE    3 NA  67.3     i 2023-12-25         <NA>       3     <NA>
12    NA    1 NA   123  <NA> 2023-07-31         <NA>     122     <NA>
```

```
# or import workbooks
wb <- wb_load(path)
wb
```

```
A Workbook object.

Worksheets:
 Sheets: Sheet1 Sheet2
 Write order: 1, 2
```

```
# read a data frame
wb_to_df(wb)
```

```
    Var1 Var2 NA  Var3  Var4       Var5         Var6    Var7     Var8
3   TRUE    1 NA     1     a 2023-05-29 3209324 This #DIV/0! 01:27:15
4   TRUE   NA NA #NUM!     b 2023-05-23         <NA>       0 14:02:57
5   TRUE    2 NA  1.34     c 2023-02-01         <NA> #VALUE! 23:01:02
6  FALSE    2 NA  <NA> #NUM!       <NA>         <NA>       2 17:24:53
```

```
7  FALSE    3 NA  1.56     e       <NA>         <NA>    <NA>     <NA>
8  FALSE    1 NA   1.7     f 2023-03-02         <NA>     2.7 08:45:58
9     NA   NA NA  <NA>  <NA>       <NA>         <NA>    <NA>     <NA>
10 FALSE    2 NA    23     h 2023-12-24         <NA>      25     <NA>
11 FALSE    3 NA  67.3     i 2023-12-25         <NA>       3     <NA>
12    NA    1 NA   123  <NA> 2023-07-31         <NA>     122     <NA>
```

```
# and save
temp <- temp_xlsx()
if (interactive()) wb_save(wb, temp)

## or create one yourself
wb <- wb_workbook()
# add a worksheet
wb$add_worksheet("sheet")
# add some data
wb$add_data("sheet", cars)
# open it in your default spreadsheet software
if (interactive()) wb$open()
```

1.4 Authors and contributions

For a full list of all authors that have made this package possible and for whom we are greatful, please see:

```
system.file("AUTHORS", package = "openxlsx2")
```

If you feel like you should be included on this list, please let us know. If you have something to contribute, you are welcome. If something is not working as expected, open issues or if you have solved an issue, open a pull request. Please be respectful and be aware that we are volunteers doing this for fun in our unpaid free time. We will work on problems when we have time or need.

1.5 License

The `openxlsx2` package is licensed under the MIT license and is based on `openxlsx` (by Alexander Walker and Philipp Schauberger; COPYRIGHT 2014-2022) and `pugixml` (by Arseny Kapoulkine; COPYRIGHT 2006-2022). Both released under the MIT license.

1.6 A note on speed and memory usage

The current state of `openxlsx2` is that it is reasonably fast. That is, it works well with reasonably large input data when reading or writing. It may not work well with data that tests the limits of the openxml specification. Things may slow down on the R side of things, and performance and usability will depend on the speed and size of the local operating system's CPU and memory.

Note that there are at least two cases where `openxlsx2` constructs potentially large data frames (i) when loading, `openxlsx2` usually needs to read the entire input file into pugixml and convert it into long data frame(s), and `wb_to_df()` converts one long data frame into two data frames that construct the output object and (ii) when adding data to the workbook, `openxlsx2` reshapes the input data frame into a long data frame and stores it in the workbook, and writes the entire worksheet into a pugixml file that is written when it is complete. Applying cell styles, date conversions etc. will further slow down the process and finally the sheets will be zipped to provide the xlsx output.

Therefore, if you are faced with an unreasonably large dataset, either give yourself enough time, use another package to write the xlsx output (`openxlsx2` was not written with the intention of working with maximum memory efficiency), and by all means use other ways to store data (binary file formats or a database). However, we are always happy to improve, so if you have found a way to improve what we are currently doing, please let us know and open an issue or a pull request.

2 basics

Welcome to the basic manual to `openxlsx2`. In this manual you will learn how to use `openxlsx2` to import data from xlsx-files to R as well as how to export data from R to xlsx, and how to import and modify these openxml workbooks in R. This package is based on the work of many contributors to `openxlsx`. It was mostly rewritten using `pugixml` and `R6` making use of modern technology, providing a fresh and easy to use R package.

Over the years many people have worked on the tricky task to handle xls and xlsx files. Notably `openxlsx`, but there are countless other R-packages as well as third party libraries or calculation software capable of handling such files. Please feel free to use and test your files with other software and or let us know about your experience. Open an issue on github or write us a mail.

2.1 Importing data

Coming from `openxlsx` you might know about `read.xlsx()` (two functions, one for files and one for workbooks) and `readWorkbook()`. Functions that do different things, but mostly the same. In `openxlsx2` we tried our best to reduce the complexity under the hood and for the user as well. In `openxlsx2` they are replaced with `read_xlsx()`, `wb_read()` and they share the same underlying function `wb_to_df()`.

For this example we will use example data provided by the package. You can locate it in our "inst/extdata" folder. The files are included with the package source and you can open them in any calculation software as well.

2.1.1 Basic import

We begin with the `openxlsx2_example.xlsx` file by telling R where to find this file on our system

```
xlsxFile <- system.file("extdata", "openxlsx2_example.xlsx", package = "openxlsx2")
```

The object contains a path to the xlsx file and we pass this file to our function to read the workbook into R

```
# import workbook
wb_to_df(xlsxFile)
#>     Var1 Var2 NA  Var3  Var4       Var5          Var6    Var7     Var8
#> 3   TRUE    1 NA     1     a 2023-05-29 3209324 This #DIV/0! 01:27:15
#> 4   TRUE   NA NA #NUM!     b 2023-05-23          <NA>       0 14:02:57
#> 5   TRUE    2 NA  1.34     c 2023-02-01          <NA> #VALUE! 23:01:02
#> 6  FALSE    2 NA  <NA> #NUM!       <NA>          <NA>       2 17:24:53
#> 7  FALSE    3 NA  1.56     e       <NA>          <NA>    <NA>     <NA>
#> 8  FALSE    1 NA   1.7     f 2023-03-02          <NA>     2.7 08:45:58
#> 9     NA   NA NA  <NA>  <NA>       <NA>          <NA>    <NA>     <NA>
#> 10 FALSE    2 NA    23     h 2023-12-24          <NA>      25     <NA>
#> 11 FALSE    3 NA  67.3     i 2023-12-25          <NA>       3     <NA>
#> 12    NA    1 NA   123  <NA> 2023-07-31          <NA>     122     <NA>
```

The output is created as a data frame and contains data types date, logical, numeric and character. The function to import the file to R, `wb_to_df()` provides similar options as the `openxlsx` functions `read.xlsx()` and `readWorkbook()` and a few new functions we will go through the options. As you might have noticed, we return the column of the xlsx file as the row name of the data frame returned. Per default the first sheet in the workbook is imported. If you want to switch this, either provide the `sheet` parameter with the correct index or provide the sheet name.

2.1.2 colNames - first row as column name

In the previous example the first imported row was used as column name for the data frame. This is the default behavior, but not always wanted or expected. Therefore this behavior can be disabled by the user.

```
# do not convert first row to colNames
wb_to_df(xlsxFile, colNames = FALSE)
#>        B    C  D     E     F          G           H       I        J
#> 2     NA Var2 NA  Var3  Var4       Var5          Var6    Var7     Var8
#> 3   TRUE    1 NA     1     a 2023-05-29 3209324 This #DIV/0! 01:27:15
#> 4   TRUE <NA> NA #NUM!     b 2023-05-23          <NA>       0 14:02:57
#> 5   TRUE    2 NA  1.34     c 2023-02-01          <NA> #VALUE! 23:01:02
#> 6  FALSE    2 NA  <NA> #NUM!       <NA>          <NA>       2 17:24:53
#> 7  FALSE    3 NA  1.56     e       <NA>          <NA>    <NA>     <NA>
#> 8  FALSE    1 NA   1.7     f 2023-03-02          <NA>     2.7 08:45:58
#> 9     NA <NA> NA  <NA>  <NA>       <NA>          <NA>    <NA>     <NA>
#> 10 FALSE    2 NA    23     h 2023-12-24          <NA>      25     <NA>
#> 11 FALSE    3 NA  67.3     i 2023-12-25          <NA>       3     <NA>
```

```
#> 12    NA    1 NA   123  <NA> 2023-07-31         <NA>     122     <NA>
```

2.1.3 detectDates - convert cells to R dates

The creators of the openxml standard are well known for mistakenly treating something as a date and `openxlsx2` has built in ways to identify a cell as a date and will try to convert the value for you, but unfortunately this is not always a trivial task and might fail. In such a case we provide an option to disable the date conversion entirely. In this case the underlying numerical value will be returned.

```
# do not try to identify dates in the data
wb_to_df(xlsxFile, detectDates = FALSE)
#>     Var1 Var2 NA  Var3  Var4  Var5         Var6    Var7       Var8
#> 3   TRUE    1 NA     1     a 45075 3209324 This #DIV/0! 0.06059028
#> 4   TRUE   NA NA #NUM!     b 45069         <NA>       0 0.58538194
#> 5   TRUE    2 NA  1.34     c 44958         <NA> #VALUE! 0.95905093
#> 6  FALSE    2 NA  <NA> #NUM!    NA         <NA>       2 0.72561343
#> 7  FALSE    3 NA  1.56     e    NA         <NA>    <NA>         NA
#> 8  FALSE    1 NA   1.7     f 44987         <NA>     2.7 0.36525463
#> 9     NA   NA NA  <NA>  <NA>    NA         <NA>    <NA>         NA
#> 10 FALSE    2 NA    23     h 45284         <NA>      25         NA
#> 11 FALSE    3 NA  67.3     i 45285         <NA>       3         NA
#> 12    NA    1 NA   123  <NA> 45138         <NA>     122         NA
```

2.1.4 showFormula - show formulas instead of results

Sometimes things might feel off. This can be because the openxml files are not updating formula results in the sheets unless they are opened in software that provides such functionality as certain tabular calculation software. Therefore the user might be interested in the underlying functions to see what is going on in the sheet. Using `showFormula` this is possible

```
# return the underlying Excel formula instead of their values
wb_to_df(xlsxFile, showFormula = TRUE)
#>     Var1 Var2 NA  Var3  Var4       Var5         Var6            Var7     Var8
#> 3   TRUE    1 NA     1     a 2023-05-29 3209324 This            E3/0 01:27:15
#> 4   TRUE   NA NA #NUM!     b 2023-05-23         <NA>              C4 14:02:57
#> 5   TRUE    2 NA  1.34     c 2023-02-01         <NA>         #VALUE! 23:01:02
#> 6  FALSE    2 NA  <NA> #NUM!       <NA>         <NA>           C6+E6 17:24:53
#> 7  FALSE    3 NA  1.56     e       <NA>         <NA>            <NA>     <NA>
#> 8  FALSE    1 NA   1.7     f 2023-03-02         <NA>           C8+E8 08:45:58
```

```
#> 9     NA   NA NA  <NA>  <NA>       <NA>         <NA>            <NA>     <NA>
#> 10 FALSE    2 NA    23     h 2023-12-24         <NA>    SUM(C10,E10)     <NA>
#> 11 FALSE    3 NA  67.3     i 2023-12-25         <NA> PRODUCT(C11,E3)     <NA>
#> 12    NA    1 NA   123  <NA> 2023-07-31         <NA>         E12-C12     <NA>
```

2.1.5 dims - read specific dimension

Sometimes the entire worksheet contains to much data, in such case we provide functions to read only a selected dimension range. Such a range consists of either a specific cell like "A1" or a cell range in the notion used in the openxml standard

```
# read dimension withot colNames
wb_to_df(xlsxFile, dims = "A2:C5", colNames = FALSE)
#>    A    B    C
#> 2 NA   NA Var2
#> 3 NA TRUE    1
#> 4 NA TRUE <NA>
#> 5 NA TRUE    2
```

2.1.6 cols - read selected columns

If you do not want to read a specific cell, but a cell range you can use the column attribute. This attribute takes a numeric vector as argument

```
# read selected cols
wb_to_df(xlsxFile, cols = c("A:B", "G"))
#>    NA  Var1       Var5
#> 3  NA  TRUE 2023-05-29
#> 4  NA  TRUE 2023-05-23
#> 5  NA  TRUE 2023-02-01
#> 6  NA FALSE       <NA>
#> 7  NA FALSE       <NA>
#> 8  NA FALSE 2023-03-02
#> 9  NA    NA       <NA>
#> 10 NA FALSE 2023-12-24
#> 11 NA FALSE 2023-12-25
#> 12 NA    NA 2023-07-31
```

2.1.7 rows - read selected rows

The same goes with rows. You can select them using numeric vectors

```
# read selected rows
wb_to_df(xlsxFile, rows = c(2, 4, 6))
#>    Var1 Var2 NA  Var3  Var4       Var5 Var6 Var7     Var8
#> 4  TRUE   NA NA #NUM!     b 2023-05-23   NA    0 14:02:57
#> 6 FALSE    2 NA  <NA> #NUM!       <NA>   NA    2 17:24:53
```

2.1.8 convert - convert input to guessed type

In xml exists no difference between value types. All values are per default characters. To provide these as numerics, logicals or dates, `openxlsx2` and every other software dealing with xlsx files has to make assumptions about the cell type. This is especially tricky due to the notion of worksheets. Unlike in a data frame, a worksheet can have a wild mix of all types of data. Even though the conversion process from character to date or numeric is rather solid, sometimes the user might want to see the data without any conversion applied. This might be useful in cases where something unexpected happened or the import created warnings. In such a case you can look at the raw input data. If you want to disable date detection as well, please see the entry above.

```
# convert characters to numerics and date (logical too?)
wb_to_df(xlsxFile, convert = FALSE)
#>     Var1 Var2   NA  Var3  Var4       Var5         Var6    Var7     Var8
#> 3   TRUE    1 <NA>     1     a 2023-05-29 3209324 This #DIV/0! 01:27:15
#> 4   TRUE <NA> <NA> #NUM!     b 2023-05-23         <NA>       0 14:02:57
#> 5   TRUE    2 <NA>  1.34     c 2023-02-01         <NA> #VALUE! 23:01:02
#> 6  FALSE    2 <NA>  <NA> #NUM!       <NA>         <NA>       2 17:24:53
#> 7  FALSE    3 <NA>  1.56     e       <NA>         <NA>    <NA>     <NA>
#> 8  FALSE    1 <NA>   1.7     f 2023-03-02         <NA>     2.7 08:45:58
#> 9   <NA> <NA> <NA>  <NA>  <NA>       <NA>         <NA>    <NA>     <NA>
#> 10 FALSE    2 <NA>    23     h 2023-12-24         <NA>      25     <NA>
#> 11 FALSE    3 <NA>  67.3     i 2023-12-25         <NA>       3     <NA>
#> 12  <NA>    1 <NA>   123  <NA> 2023-07-31         <NA>     122     <NA>
```

2.1.9 skipEmptyRows - remove empty rows

Even though `openxlsx2` imports everything as requested, sometimes it might be helpful to remove empty lines from the data. These might be either left empty intentional or empty because they are were formatted, but the cell value was removed afterwards. This was added

mostly for backward comparability, but the default has been changed to `FALSE`. The behavior has changed a bit as well. Previously empty cells were removed prior to the conversion to R data frames, now they are removed after the conversion and are removed only if they are completely empty

```
# erase empty Rows from dataset
wb_to_df(xlsxFile, sheet = 1, skipEmptyRows = TRUE) |> tail()
#>     Var1 Var2 NA Var3  Var4       Var5 Var6 Var7     Var8
#> 6  FALSE    2 NA <NA> #NUM!       <NA> <NA>    2 17:24:53
#> 7  FALSE    3 NA 1.56     e       <NA> <NA> <NA>     <NA>
#> 8  FALSE    1 NA  1.7     f 2023-03-02 <NA>  2.7 08:45:58
#> 10 FALSE    2 NA   23     h 2023-12-24 <NA>   25     <NA>
#> 11 FALSE    3 NA 67.3     i 2023-12-25 <NA>    3     <NA>
#> 12    NA    1 NA  123  <NA> 2023-07-31 <NA>  122     <NA>
```

2.1.10 skipEmptyCols - remove empty columns

The same for columns

```
# erase empty Cols from dataset
wb_to_df(xlsxFile, skipEmptyCols = TRUE)
#>     Var1 Var2  Var3  Var4       Var5         Var6    Var7     Var8
#> 3   TRUE    1     1     a 2023-05-29 3209324 This #DIV/0! 01:27:15
#> 4   TRUE   NA #NUM!     b 2023-05-23         <NA>       0 14:02:57
#> 5   TRUE    2  1.34     c 2023-02-01         <NA> #VALUE! 23:01:02
#> 6  FALSE    2  <NA> #NUM!       <NA>         <NA>       2 17:24:53
#> 7  FALSE    3  1.56     e       <NA>         <NA>    <NA>     <NA>
#> 8  FALSE    1   1.7     f 2023-03-02         <NA>     2.7 08:45:58
#> 9     NA   NA  <NA>  <NA>       <NA>         <NA>    <NA>     <NA>
#> 10 FALSE    2    23     h 2023-12-24         <NA>      25     <NA>
#> 11 FALSE    3  67.3     i 2023-12-25         <NA>       3     <NA>
#> 12    NA    1   123  <NA> 2023-07-31         <NA>     122     <NA>
```

2.1.11 rowNames - keep rownames from input

Sometimes the data source might provide rownames as well. In such a case you can `openxlsx2` to treat the first column as rowname

```
# convert first row to rownames
wb_to_df(xlsxFile, sheet = 2, dims = "C6:G9", rowNames = TRUE)
```

```
#>                mpg cyl disp  hp
#> Mazda RX4     21.0   6  160 110
#> Mazda RX4 Wag 21.0   6  160 110
#> Datsun 710    22.8   4  108  93
```

2.1.12 types - convert column to specific type

If the user know better than the software what type to expect in a worksheet, this can be provided via types. This parameter takes a named numeric. `0` is character, `1` is numeric and `2` is date

```
# define type of the data.frame
wb_to_df(xlsxFile, cols = c(2, 5), types = c("Var1" = 0, "Var3" = 1))
#>     Var1   Var3
#> 3   TRUE   1.00
#> 4   TRUE    NaN
#> 5   TRUE   1.34
#> 6  FALSE     NA
#> 7  FALSE   1.56
#> 8  FALSE   1.70
#> 9   <NA>     NA
#> 10 FALSE  23.00
#> 11 FALSE  67.30
#> 12  <NA> 123.00
```

2.1.13 startRow - where to begin

Often the creator of the worksheet has used a lot of creativity and the data does not begin in the first row, instead it begins somewhere else. To define the row where to begin reading, define it via the `startRow` parameter

```
# start in row 5
wb_to_df(xlsxFile, startRow = 5, colNames = FALSE)
#>        B  C  D      E     F          G  H       I        J
#> 5   TRUE  2 NA   1.34     c 2023-02-01 NA #VALUE! 23:01:02
#> 6  FALSE  2 NA     NA #NUM!       <NA> NA       2 17:24:53
#> 7  FALSE  3 NA   1.56     e       <NA> NA    <NA>     <NA>
#> 8  FALSE  1 NA   1.70     f 2023-03-02 NA     2.7 08:45:58
#> 9     NA NA NA     NA  <NA>       <NA> NA    <NA>     <NA>
#> 10 FALSE  2 NA  23.00     h 2023-12-24 NA      25     <NA>
```

```
#> 11 FALSE  3 NA  67.30     i 2023-12-25 NA       3     <NA>
#> 12    NA  1 NA 123.00  <NA> 2023-07-31 NA     122     <NA>
```

2.1.14 na.strings - define missing values

There is the "#N/A" string, but often the user will be faced with custom missing values and other values we are not interested. Such strings can be passed as character vector via `na.strings`

```
# na string
wb_to_df(xlsxFile, na.strings = "")
#>     Var1 Var2 NA  Var3  Var4       Var5         Var6    Var7     Var8
#> 3   TRUE    1 NA     1     a 2023-05-29 3209324 This #DIV/0! 01:27:15
#> 4   TRUE   NA NA #NUM!     b 2023-05-23         <NA>       0 14:02:57
#> 5   TRUE    2 NA  1.34     c 2023-02-01         <NA> #VALUE! 23:01:02
#> 6  FALSE    2 NA  <NA> #NUM!       <NA>         <NA>       2 17:24:53
#> 7  FALSE    3 NA  1.56     e       <NA>         <NA>    <NA>     <NA>
#> 8  FALSE    1 NA   1.7     f 2023-03-02         <NA>     2.7 08:45:58
#> 9     NA   NA NA  <NA>  <NA>       <NA>         <NA>    <NA>     <NA>
#> 10 FALSE    2 NA    23     h 2023-12-24         <NA>      25     <NA>
#> 11 FALSE    3 NA  67.3     i 2023-12-25         <NA>       3     <NA>
#> 12    NA    1 NA   123  <NA> 2023-07-31         <NA>     122     <NA>
```

2.1.15 Importing as workbook

In addition to importing directly from xlsx or xlsm files, `openxlsx2` provides the `wbWorkbook` class used for importing and modifying entire the openxml files in `R`. This `workbook` class is the heart of `openxlsx2` and probably the reason why you are reading this manual in the first place.

Importing a file into a workbook looks like this:

```
# the file we are going to load
xlsxFile <- system.file("extdata", "openxlsx2_example.xlsx", package = "openxlsx2")
# loading the file into the workbook
wb <- wb_load(file = xlsxFile)
```

The additional options `wb_load()` provides are for internal use: `sheet` loads only a selected sheet from the workbook and `data_only` reads only the data parts from a workbook and ignores any additional graphics or pivot tables. Both functions create workbook objects that

can only be used to read data, and we do not recommend end users to use them. Especially not if they intend to re-export the workbook afterwards.

Once a workbook is imported, we provide several functions to interact with and modify it (the `wb_to_df()` function mentioned above works the same way for an imported workbook). It is possible to add new sheets and remove sheets, as well as to add or remove data. R-plots can be inserted and also the style of the workbook can be changed, new fonts, background colors and number formats. There is a wealth of options explained in the man pages and the additional style vignette (more vignettes to follow).

2.2 Exporting data

2.2.1 Exporting data frames or vectors

If you want to export a data frame from R, you can use `write_xlsx()` which will create an xlsx file. This file can be tweaked further. The man page provides various options (further explanation and examples will follow).

```
write_xlsx(mtcars, "mtcars.xlsx")
```

2.2.2 Exporting `wbWorkbooks`

Imported workbooks can be saved as xlsx or xlsm files with the wrapper `wb_save()` or with `wb$save()`. Both functions take the filename and an optional `Overwrite` option. If the latter is set, an optional guard is provided to check if the file you want to write already exists. But be careful, this is optional. The default is to save the file and replace an existing file. Of course, in Windows, files that are locked (for example, if they were opened by another process) will not be replaced.

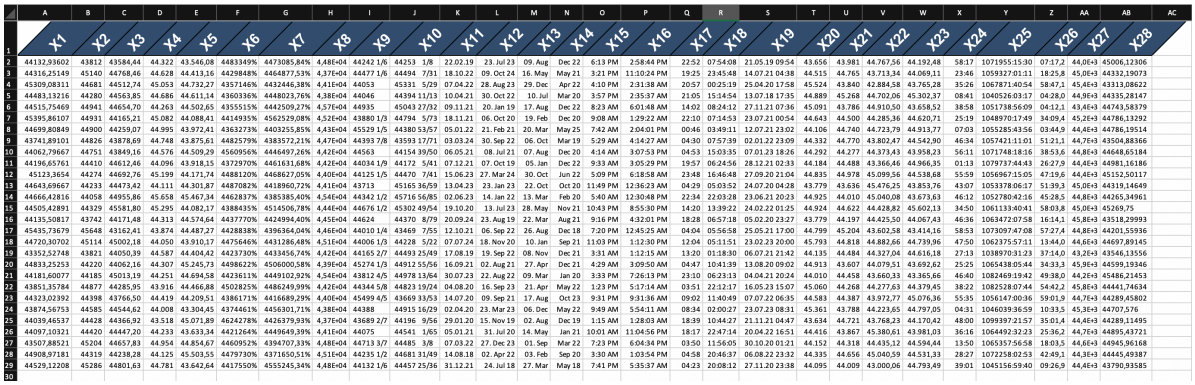
```
# replace the existing file
wb$save("mtcars.xlsx")

# do not overwrite the exisisting file
try(wb$save("mtcars.xlsx", overwrite = FALSE))
```

3 styling

Welcome to the styling manual for `openxlsx2`. In this manual you will learn how to use `openxlsx2` to style your worksheets. data from xlsx-files to R as well as how to export data from R to xlsx, and how to import and modify these openxml workbooks in R.

3.1 Colors, text rotation and number formats

Below we show you two ways how to create styled tables with `openxlsx2` one using the high level functions to style worksheet areas and one using the bare metal approach of creating the identical table. We show both ways to create styles in `openxlsx2` to show how you could build on our functions or create your very own functions.



	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	X24	X25	X26	X27	X28
2	44132,93602	43812	43584,44	44.322	43.546,08	4483349%	4473085,84%	4,48E+04	44242 1/6	44253 1/8	22.02.19	23. Jul 23	09. Aug	Dec 22	6:13 PM	2:58:44 PM	22:52	07:54:08	21.05.19 09:54	43.656	43.981	44.767,56	44.192,48	58:17	1071955:15:30	07:17,2	44,0E+3	45006,12306
3	44316,25149	45140	44768,46	44.628	44.413,16	4429848%	4464877,53%	4,37E+04	44477 1/6	44494 7/31	18.10.22	09. Oct 24	16. May	May 21	3:21 PM	11:10:24 PM	19:25	23:45:48	14.07.21 04:38	44.515	44.765	43.713,34	44.069,11	23:46	1059327:01:11	18:25,8	45,0E+3	44332,19073
4	45309,08311	44681	44512,74	45.053	44.732,27	4357146%	4432446,38%	4,41E+04	44053	45331 5/29	07.04.22	28. Aug 23	29. Dec	Apr 22	4:10 PM	2:31:38 AM	20:57	00:25:19	25.04.20 17:58	45.524	43.840	42.884,58	43.765,28	35:26	1067871:40:54	58:47,1	45,4E+3	43313,08622
5	44483,13216	44280	44563,85	44.686	44.611,14	4360336%	4448023,76%	4,38E+04	44046	44394 11/13	10.04.21	30. Oct 22	10. Jul	Mar 20	3:57 PM	2:35:37 AM	21:05	15:14:54	13.07.18 17:35	44.889	45.268	44.702,06	45.302,37	08:41	1040526:03:17	04:28,0	44,9E+3	44335,28147
6	44515,75469	44941	44654,70	44.263	44.502,65	4355515%	4442509,27%	4,57E+04	44935	45043 27/32	09.11.21	20. Jan 19	17. Aug	Dec 22	8:23 AM	6:01:48 AM	14:02	08:24:12	27.11.21 07:36	45.091	43.786	44.910,50	43.658,52	38:58	1051738:56:09	04:12,1	43,4E+3	44743,58379
7	45395,86107	44931	44165,21	45.082	44.088,41	4414935%	4562529,08%	4,52E+04	43880 1/3	44794 5/73	18.11.21	06. Oct 20	19. Feb	Dec 20	9:08 AM	1:29:22 AM	22:10	07:14:53	23.07.21 00:54	44.643	44.500	44.285,36	44.620,71	25:19	1048970:17:49	34:09,4	45,2E+3	44786,13292
8	44699,80849	44900	44259,07	44.995	43.972,41	4363273%	4403255,85%	4,43E+04	45529 1/5	44380 53/57	05.01.22	21. Feb 21	20. Mar	May 25	7:42 AM	2:04:01 PM	00:46	03:49:11	12.07.21 23:02	44.106	44.740	44.723,79	44.913,77	07:03	1055285:43:56	03:44,9	44,4E+3	44786,19514
9	43741,89101	44826	43878,69	44.748	43.875,61	4482579%	4383572,21%	4,47E+04	44393 7/8	43593 17/71	03.03.24	30. Sep 22	06. Oct	Mar 19	5:29 AM	4:14:27 AM	04:30	07:57:39	02.01.22 23:09	44.332	44.770	43.802,47	44.542,90	46:34	1057421:11:01	51:21,1	44,7E+3	43504,88366
10	44062,79667	44751	43849,16	44.576	44.509,29	4560956%	4446497,26%	4,42E+04	44563	44154 39/50	06.05.21	08. Jul 21	07. Aug	Dec 20	4:14 AM	3:07:53 PM	04:53	15:03:35	07.01.23 18:26	44.292	44.277	44.373,43	43.958,23	56:11	1071748:18:16	38:53,6	44,8E+3	44648,65184
11	44196,65761	44410	44612,46	44.096	43.918,15	4372970%	4461631,68%	4,42E+04	44034 1/9	44172 5/41	07.12.21	07. Oct 19	05. Jan	Dec 22	9:33 AM	3:05:29 PM	19:57	06:24:56	28.12.21 02:33	44.184	44.488	43.366,46	44.966,35	01:13	1079737:44:43	26:27,9	44,4E+3	44981,16186
12	45123,3654	44274	44692,76	45.199	44.171,74	4488120%	4468627,05%	4,40E+04	44125 1/5	44470 7/41	15.06.23	27. Mar 24	30. Oct	Jun 22	5:09 PM	6:18:58 AM	23:48	16:46:48	27.09.20 21:04	44.835	44.978	45.099,56	44.538,68	55:59	1056967:15:05	47:19,6	44,4E+3	45152,50117
13	44643,69667	44233	44473,42	44.111	44.301,87	4487082%	4418960,72%	4,41E+04	43713	45165 36/59	13.04.23	23. Jan 23	22. Oct	Oct 20	11:49 PM	12:36:23 AM	04:29	05:03:52	24.07.20 04:28	43.779	43.636	45.476,25	43.853,76	43:07	1053378:06:17	51:39,3	45,0E+3	44319,14649
14	44666,42816	44058	44955,86	45.658	45.467,34	4462837%	4385385,40%	4,54E+04	44342 1/2	45716 56/85	02.06.23	14. Jan 22	13. Mar	Feb 20	5:40 AM	12:30:48 PM	22:34	22:03:28	23.06.21 20:23	44.925	44.010	45.040,08	43.673,63	46:12	1052780:42:16	45:28,5	44,8E+3	44265,34961
15	44505,42891	44329	45581,80	45.295	44.082,17	4388435%	4514506,78%	4,44E+04	44676 1/2	45302 49/54	19.10.20	13. Jul 23	28. May	Nov 21	10:43 PM	8:55:30 PM	14:20	13:39:22	24.02.22 01:25	44.924	44.622	44.428,82	45.602,13	34:50	1061133:40:41	58:03,8	45,0E+3	45269,75
16	44135,50817	43742	44171,48	44.313	44.574,64	4437770%	4424994,40%	4,45E+04	44624	44370 8/79	20.09.24	23. Aug 19	22. Mar	Aug 21	9:16 PM	4:32:01 PM	18:28	06:57:18	05.02.20 23:27	43.779	44.197	44.425,50	44.067,43	46:36	1063472:07:58	16:14,1	45,8E+3	43518,29993
17	45435,73679	45648	43162,41	43.874	44.487,27	4428838%	4396364,04%	4,46E+04	44010 1/4	43469 7/55	12.10.21	06. Sep 22	26. Aug	Dec 18	7:20 PM	12:45:25 AM	04:04	05:56:58	25.05.21 17:00	44.799	45.204	43.602,58	43.414,16	58:53	1073097:47:08	57:27,4	44,8E+3	44201,55936
18	44720,30702	45114	45002,18	44.050	43.910,17	4475646%	4431286,48%	4,51E+04	44006 1/3	44228 5/22	07.07.24	18. Nov 20	10. Jan	Sep 21	11:03 PM	1:12:30 PM	12:04	05:11:51	23.02.23 20:00	45.793	44.818	44.882,66	44.739,96	47:50	1062375:57:11	13:44,0	44,6E+3	44697,89145
19	43352,52748	43821	44050,39	44.587	44.404,42	4423730%	4433456,74%	4,42E+04	44165 2/7	44493 25/49	17.08.19	19. Sep 22	08. Nov	Dec 21	3:31 AM	1:12:15 AM	13:20	01:18:30	06.07.21 21:42	44.135	44.484	44.327,04	44.616,18	27:13	1038970:31:23	37:14,0	43,2E+3	43546,13556
20	44833,25253	44220	44062,16	44.307	45.245,73	4498622%	4506000,58%	4,39E+04	45274 1/3	44912 55/56	16.09.21	02. Aug 21	27. Apr	Dec 21	4:29 AM	3:09:50 AM	04:47	10:41:39	13.08.20 09:02	44.913	43.607	44.079,51	43.692,62	25:25	1065438:05:44	34:33,3	45,9E+3	44599,19346
21	44181,60077	44185	45013,19	44.251	44.694,58	4423611%	4449102,92%	4,54E+04	43812 4/5	44978 13/64	30.07.23	22. Aug 22	09. Mar	Jan 20	3:33 PM	7:26:13 PM	23:10	06:23:13	04.04.21 20:24	44.010	44.458	43.660,33	43.365,66	46:40	1082469:19:42	49:38,0	44,2E+3	45486,21453
22	43851,35784	44877	44285,95	43.916	44.466,88	4502825%	4486249,99%	4,42E+04	44344 5/8	44823 19/24	04.08.20	16. Sep 23	21. Apr	May 22	1:23 PM	5:17:14 AM	03:51	22:12:17	16.05.23 15:07	45.060	44.268	44.277,63	44.379,45	38:22	1082528:07:44	54:42,2	45,8E+3	44441,74634
23	44323,02392	44398	43766,50	44.419	44.209,51	4386171%	4416689,29%	4,40E+04	45499 4/5	43669 33/53	14.07.20	09. Sep 21	17. Aug	Oct 23	9:31 PM	9:31:36 AM	09:02	11:40:49	07.07.22 06:35	44.583	44.387	43.972,77	45.076,36	55:35	1056147:00:36	59:01,9	44,7E+3	44289,45802
24	43874,56753	44585	44544,62	44.008	43.304,45	4374461%	4456301,71%	4,38E+04	44388	44915 16/29	02.04.20	23. Mar 23	06. Dec	May 22	9:49 AM	5:54:11 AM	08:34	02:00:27	23.07.23 08:31	45.361	43.788	44.223,65	44.797,05	04:31	1046039:36:59	10:33,5	45,3E+3	44707,576
25	44039,46537	44428	44366,92	43.518	45.071,89	4624278%	4426379,93%	4,37E+04	43689 2/7	44196 9/56	29.01.20	15. Nov 19	02. Aug	Dec 19	1:15 AM	1:28:03 AM	18:39	10:44:27	21.11.21 04:47	43.634	44.721	43.768,23	44.170,42	48:00	1099397:21:57	35:01,4	44,4E+3	44289,11495
26	44097,10321	44420	44447,20	44.233	43.633,34	4421264%	4449649,39%	4,41E+04	44075	44541 1/65	05.01.21	31. Jul 20	14. May	Jan 21	10:01 AM	11:04:56 PM	18:17	22:47:14	20.04.22 16:51	44.416	43.867	45.380,61	43.981,03	36:16	1064492:32:23	25:36,2	44,7E+3	44895,43721
27	43507,88521	45204	44657,83	44.954	44.854,67	4460952%	4394707,33%	4,48E+04	44713 3/7	44485 3/8	07.03.22	27. Dec 23	01. Sep	Mar 22	7:23 PM	6:04:34 PM	03:50	11:56:05	30.10.20 01:21	44.152	44.318	44.435,12	44.594,44	13:50	1065357:56:58	18:03,5	44,6E+3	44945,96168
28	44908,97181	44319	44238,28	44.125	45.503,55	4479730%	4371650,51%	4,51E+04	44235 1/2	44681 31/49	14.08.18	02. Apr 22	03. Feb	Sep 20	3:30 AM	1:03:54 PM	04:58	20:46:37	06.08.22 23:32	44.335	44.656	45.040,59	44.531,33	28:27	1072258:02:53	42:49,1	44,3E+3	44445,49387
29	44529,12208	45286	44801,63	44.781	43.642,64	4417550%	4555245,34%	4,48E+04	44132 1/6	44457 25/36	31.12.21	24. Jul 18	27. Mar	May 18	7:41 PM	5:35:37 AM	04:23	20:08:12	27.11.20 23:38	44.095	44.009	43.000,06	44.793,49	39:01	1045156:59:40	09:26,9	44,4E+3	43790,93585

Figure 3.1: The example below, with increased column width.

3.1.1 the quick way: using high level functions

```
# add some dummy data
set.seed(123)
mat <- matrix(rnorm(28 * 28, mean = 44444, sd = 555), ncol = 28)
colnames(mat) <- make.names(seq_len(ncol(mat)))
border_col <- wb_color(theme = 1)
border_sty <- "thin"
```

```r
# prepare workbook with data and formated first row
wb <- wb_workbook() %>%
  wb_add_worksheet("test") %>%
  wb_add_data(x = mat) %>%
  wb_add_border(dims = "A1:AB1",
    top_color = border_col, top_border = border_sty,
    bottom_color = border_col, bottom_border = border_sty,
    left_color = border_col, left_border = border_sty,
    right_color = border_col, right_border = border_sty,
    inner_hcolor = border_col, inner_hgrid = border_sty
  ) %>%
  wb_add_fill(dims = "A1:AB1", color = wb_color(hex = "FF334E6F")) %>%
  wb_add_font(dims = "A1:AB1", name = "Arial", bold = TRUE, color = wb_color(hex = "FFFFFF
  wb_add_cell_style(dims = "A1:AB1", horizontal = "center", textRotation = 45)

# create various number formats
x <- c(
  0, 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22,
  37, 38, 39, 40, 45, 46, 47, 48, 49
)

# apply the styles
for (i in seq_along(x)) {
  cell <- sprintf("%s2:%s29", int2col(i), int2col(i))
  wb <- wb %>% wb_add_numfmt(dims = cell, numfmt = x[i])
}

# wb$open()
```

3.1.2 the long way: using bare metal functions

```r
# create workbook
wb <- wb_workbook() %>% wb_add_worksheet("test")

# add some dummy data to the worksheet
set.seed(123)
mat <- matrix(rnorm(28 * 28, mean = 44444, sd = 555), ncol = 28)
colnames(mat) <- make.names(seq_len(ncol(mat)))
wb$add_data(x = mat, colNames = TRUE)
```

```r
# create a border style and assign it to the workbook
black <- wb_color(hex = "FF000000")
new_border <- create_border(
  bottom = "thin", bottom_color = black,
  top = "thin", top_color = black,
  left = "thin", left_color = black,
  right = "thin", right_color = black
)
wb$styles_mgr$add(new_border, "new_border")


# create a fill style and assign it to the workbook
new_fill <- create_fill(patternType = "solid", fgColor = wb_color(hex = "FF334E6F"))
wb$styles_mgr$add(new_fill, "new_fill")

# create a font style and assign it to the workbook
new_font <- create_font(sz = 20, name = "Arial", b = TRUE, color = wb_color(hex = "FFFFFFF
wb$styles_mgr$add(new_font, "new_font")

# create a new cell style, that uses the fill, the font and the border style
new_cellxfs <- create_cell_style(
  numFmtId = 0,
  horizontal = "center",
  textRotation = 45,
  fillId = wb$styles_mgr$get_fill_id("new_fill"),
  fontId = wb$styles_mgr$get_font_id("new_font"),
  borderId = wb$styles_mgr$get_border_id("new_border")
)
# assign this style to the workbook
wb$styles_mgr$add(new_cellxfs, "new_styles")

# assign the new cell style to the header row of our data set
cell <- sprintf("A1:%s1", int2col(nrow(mat)))
wb <- wb %>% wb_set_cell_style(
  dims = cell,
  style = wb$styles_mgr$get_xf_id("new_styles")
)

## style the cells with some builtin format codes (no new numFmt entry is needed)
# add builtin style ids
x <- c(
```

```
  1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22,
  37, 38, 39, 40, 45, 46, 47, 48, 49
)

# create styles
new_cellxfs <- create_cell_style(numFmtId = x, horizontal = "center")

# assign the styles to the workbook
for (i in seq_along(x)) {
  wb$styles_mgr$add(new_cellxfs[i], paste0("new_style", i))
}

# new styles are 1:28
new_styles <- wb$styles_mgr$get_xf()
for (i in as.integer(new_styles$id[new_styles$name %in% paste0("new_style", seq_along(x))]
  cell <- sprintf("%s2:%s29", int2col(i), int2col(i))
  wb <- wb %>% wb_set_cell_style(dims = cell, style = i)
}

# assign a custom tabColor
wb$worksheets[[1]]$sheetPr <- xml_node_create(
  "sheetPr",
  xml_children = xml_node_create(
    "tabColor",
    xml_attributes = wb_color(hex = "FF00FF00")
  )
)

# # look at the beauty you've created
# wb_open(wb)
```

4 Working with number formats

Per default `openxlsx2` will pick up number formats for selected R classes.

4.1 numfmts

```
## Create Workbook object and add worksheets
wb <- wb_workbook()
wb$add_worksheet("S1")
wb$add_worksheet("S2")

df <- data.frame(
  "Date" = Sys.Date() - 0:19,
  "T" = TRUE, "F" = FALSE,
  "Time" = Sys.time() - 0:19 * 60 * 60,
  "Cash" = paste("$", 1:20), "Cash2" = 31:50,
  "hLink" = "https://CRAN.R-project.org/",
  "Percentage" = seq(0, 1, length.out = 20),
  "TinyNumbers" = runif(20) / 1E9, stringsAsFactors = FALSE
)

## openxlsx will apply default Excel styling for these classes
class(df$Cash) <- c(class(df$Cash), "currency")
class(df$Cash2) <- c(class(df$Cash2), "accounting")
class(df$hLink) <- "hyperlink"
class(df$Percentage) <- c(class(df$Percentage), "percentage")
class(df$TinyNumbers) <- c(class(df$TinyNumbers), "scientific")

wb$add_data("S1", x = df, startRow = 4, rowNames = FALSE)
wb$add_data_table("S2", x = df, startRow = 4, rowNames = FALSE)
```

4.2 numfmts2

In addition, you can set the style to be picked up using `openxlsx2` options.

```r
wb <- wb_workbook()
wb <- wb_add_worksheet(wb, "test")

options("openxlsx2.dateFormat" = "yyyy")
options("openxlsx2.datetimeFormat" = "yyyy-mm-dd")
options("openxlsx2.numFmt" = "€ #.0")

df <- data.frame(
  "Date" = Sys.Date() - 0:19,
  "T" = TRUE, "F" = FALSE,
  "Time" = Sys.time() - 0:19 * 60 * 60,
  "Cash" = paste("$", 1:20), "Cash2" = 31:50,
  "hLink" = "https://CRAN.R-project.org/",
  "Percentage" = seq(0, 1, length.out = 20),
  "TinyNumbers" = runif(20) / 1E9, stringsAsFactors = FALSE,
  "numeric" = 1
)

## openxlsx will apply default Excel styling for these classes
class(df$Cash) <- c(class(df$Cash), "currency")
class(df$Cash2) <- c(class(df$Cash2), "accounting")
class(df$hLink) <- "hyperlink"
class(df$Percentage) <- c(class(df$Percentage), "percentage")
class(df$TinyNumbers) <- c(class(df$TinyNumbers), "scientific")

wb$add_data("test", df)
```

5 Modifying the column widths

5.1 wb_set_col_widths

```
wb <- wb_workbook() %>%
  wb_add_worksheet() %>%
  wb_add_data(x = mtcars, rowNames = TRUE)

cols <- 1:12
wb <- wb %>% wb_set_col_widths(cols = cols, widths = "auto")
```

6 Adding borders

6.1 add borders

```
wb <- wb_workbook()
# full inner grid
wb$add_worksheet("S1", gridLines = FALSE)$add_data(x = mtcars)
wb$add_border(
  dims = "A2:K33",
  inner_hgrid = "thin", inner_hcolor = wb_color(hex = "FF808080"),
  inner_vgrid = "thin", inner_vcolor = wb_color(hex = "FF808080")
)
# only horizontal grid
wb$add_worksheet("S2", gridLines = FALSE)$add_data(x = mtcars)
wb$add_border(dims = "A2:K33", inner_hgrid = "thin", inner_hcolor = wb_color(hex = "FF8080
# only vertical grid
wb$add_worksheet("S3", gridLines = FALSE)$add_data(x = mtcars)
wb$add_border(dims = "A2:K33", inner_vgrid = "thin", inner_vcolor = wb_color(hex = "FF8080
# no inner grid
wb$add_worksheet("S4", gridLines = FALSE)$add_data(x = mtcars)
wb$add_border("S4", dims = "A2:K33")
```

6.2 styled table

Below we show you two ways how to create styled tables with `openxlsx2` one using the high level functions to style worksheet areas and one using the bare metal approach of creating the identical table.

X1	X2
1	3
2	4

6.2.1 the quick way: using high level functions

```
# add some dummy data to the worksheet
mat <- matrix(1:4, ncol = 2, nrow = 2)
colnames(mat) <- make.names(seq_len(ncol(mat)))

wb <- wb_workbook() %>%
  wb_add_worksheet("test") %>%
  wb_add_data(x = mat, colNames = TRUE, startCol = 2, startRow = 2) %>%
  # center first row
  wb_add_cell_style(dims = "B2:C2", horizontal = "center") %>%
  # add border for first row
  wb_add_border(
    dims = "B2:C2",
    bottom_color = wb_color(theme = 1), bottom_border = "thin",
    top_color = wb_color(theme = 1), top_border = "double",
    left_border = NULL, right_border = NULL
  ) %>%
  # add border for last row
  wb_add_border(
    dims = "B4:C4",
    bottom_color = wb_color(theme = 1), bottom_border = "double",
    top_border = NULL, left_border = NULL, right_border = NULL
  )
```

6.2.2 the long way: creating everything from the bone

```
# add some dummy data to the worksheet
mat <- matrix(1:4, ncol = 2, nrow = 2)
colnames(mat) <- make.names(seq_len(ncol(mat)))

wb <- wb_workbook() %>%
  wb_add_worksheet("test") %>%
  wb_add_data(x = mat, startCol = 2, startRow = 2)

# create a border style and assign it to the workbook
black <- wb_color(hex = "FF000000")
top_border <- create_border(
  top = "double", top_color = black,
  bottom = "thin", bottom_color = black
```

```
)

bottom_border <- create_border(bottom = "double", bottom_color = black)

wb$styles_mgr$add(top_border, "top_border")
wb$styles_mgr$add(bottom_border, "bottom_border")

# create a new cell style, that uses the fill, the font and the border style
top_cellxfs <- create_cell_style(
  numFmtId = 0,
  horizontal = "center",
  borderId = wb$styles_mgr$get_border_id("top_border")
)
bottom_cellxfs <- create_cell_style(
  numFmtId = 0,
  borderId = wb$styles_mgr$get_border_id("bottom_border")
)

# assign this style to the workbook
wb$styles_mgr$add(top_cellxfs, "top_styles")
wb$styles_mgr$add(bottom_cellxfs, "bottom_styles")

# assign the new cell style to the header row of our data set
cell <- "B2:C2"
wb <- wb %>% wb_set_cell_style(dims = cell, style = wb$styles_mgr$get_xf_id("top_styles"))
cell <- "B4:C4"
wb <- wb %>% wb_set_cell_style(dims = cell, style = wb$styles_mgr$get_xf_id("bottom_styles
```

7 Use workbook colors and modify them

The loop below will apply the tint attribute to the fill color

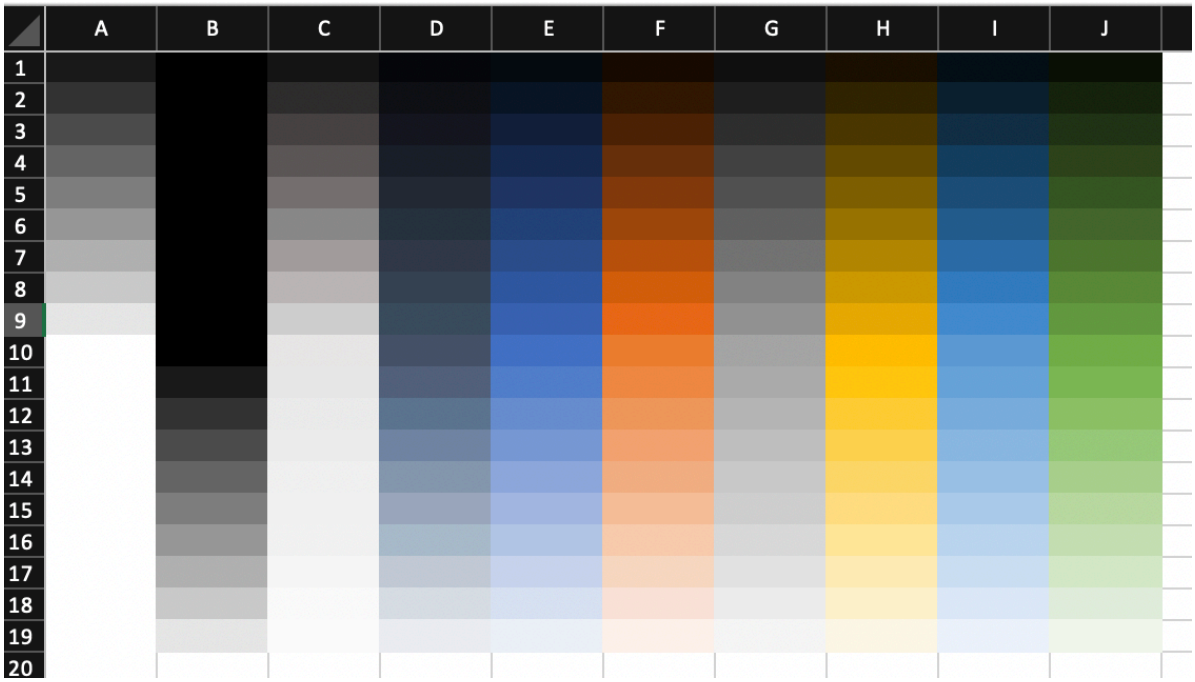


Figure 7.1: Tint variations of the theme colors.

```
wb <- wb_workbook() %>% wb_add_worksheet("S1")

tints <- seq(-0.9, 0.9, by = 0.1)

for (i in 0:9) {
  for (tnt in tints) {
    col <- paste0(int2col(i + 1), which(tints %in% tnt))

    if (tnt == 0) {
      wb <- wb %>% wb_add_fill(dims = col, color = wb_color(theme = i))
    } else {
```

```
      wb <- wb %>% wb_add_fill(dims = col, color = wb_color(theme = i, tint = tnt))
    }
  }
}
```

8 Copy cell styles

It is possible to copy the styles of several cells at once. In the following example, the styles of some cells from a formatted workbook are applied to a previously empty cell range. Be careful though, `wb_get_cell_style()` returns only some styles, so you have to make sure that the copy-from and copy-to dimensions match in a meaningful way.

```
wb <- wb_load(system.file("extdata", "oxlsx2_sheet.xlsx", package = "openxlsx2")) %>%
  wb_set_cell_style(1, "A30:G35", wb_get_cell_style(., 1, "A10:G15"))
# wb_open(wb)
```

9 Style strings

Using `fmt_txt()` is possible to style strings independently of the cell containing the string.

```
txt <- paste(
  fmt_txt("Embracing the full potential of "),
  fmt_txt("openxlsx2", bold = TRUE, size = 16),
  fmt_txt(" with "),
  fmt_txt("fmt_txt()", font = "Courier"),
  fmt_txt(" !")
)
wb <- wb_workbook()$add_worksheet()$add_data(x = txt)
```

As shown above it is possible to combine multiple styles together into a longer string. It is even possible to use `fmt_txt()` as `na.strings`:

```
df <- mtcars
df[df < 4] <- NA

na_red <- fmt_txt("N/A", color = wb_color("red"), italic = TRUE, bold = TRUE)

wb <- wb_workbook()$add_worksheet()$add_data(x = df, na.strings = na_red)
```

10 Create custom table styles

With `create_tablestyle()` it is possible to create your own table styles. This function uses `create_dxfs_style()` (just like your spreadsheet software does). Therefore, it is not quite as user-friendly. The following example shows how the function creates a red table style. The various dxfs styles must be created and assigned to the workbook (similar styles are used in conditional formatting). In `create_tablestyle()` these styles are assigned to the table style elements. Once the table style is created, it must also be assigned to the workbook. After that you can use it in the workbook like any other table style.

```
# a red table style
dx0 <- create_dxfs_style(
  border = TRUE,
  left_color = wb_color("red"),
  right_color = NULL, right_style = NULL,
  top_color = NULL, top_style = NULL,
  bottom_color = NULL, bottom_style = NULL
)

dx1 <- create_dxfs_style(
  border = TRUE,
  left_color = wb_color("red"),
  right_color = NULL, right_style = NULL,
  top_color = NULL, top_style = NULL,
  bottom_color = NULL, bottom_style = NULL
)

dx2 <- create_dxfs_style(
  border = TRUE,
  top_color = wb_color("red"),
  left_color = NULL, left_style = NULL,
  right_color = NULL, right_style = NULL,
  bottom_color = NULL, bottom_style = NULL
)

dx3 <- create_dxfs_style(
```

```
  border = TRUE,
  top_color = wb_color("red"),
  left_color = NULL, left_style = NULL,
  right_color = NULL, right_style = NULL,
  bottom_color = NULL, bottom_style = NULL
)

dx4 <- create_dxfs_style(
  text_bold = TRUE
)

dx5 <- create_dxfs_style(
  text_bold = TRUE
)

dx6 <- create_dxfs_style(
  font_color = wb_color("red"),
  text_bold = TRUE,
  border = TRUE,
  top_style = "double",
  left_color = NULL, left_style = NULL,
  right_color = NULL, right_style = NULL,
  bottom_color = NULL, bottom_style = NULL
)

dx7 <- create_dxfs_style(
  font_color = wb_color("white"),
  text_bold = TRUE,
  bgFill = wb_color("red"),
  fgColor = wb_color("red")
)

dx8 <- create_dxfs_style(
  border = TRUE,
  left_color = wb_color("red"),
  top_color = wb_color("red"),
  right_color = wb_color("red"),
  bottom_color = wb_color("red")
)
```

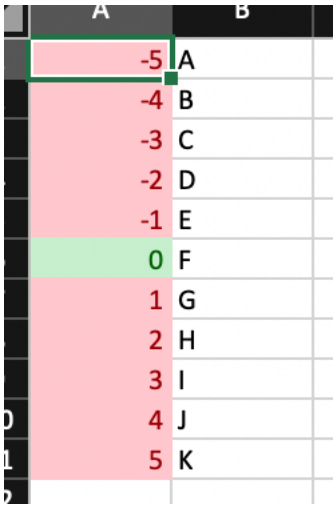
```
wb <- wb_workbook() %>%
  wb_add_worksheet(gridLines = FALSE)

wb$add_style(dx0)
wb$add_style(dx1)
wb$add_style(dx2)
wb$add_style(dx3)
wb$add_style(dx4)
wb$add_style(dx5)
wb$add_style(dx6)
wb$add_style(dx7)
wb$add_style(dx8)

# finally create the table
xml <- create_tablestyle(
  name               = "red_table",
  wholeTable         = wb$styles_mgr$get_dxf_id("dx8"),
  headerRow          = wb$styles_mgr$get_dxf_id("dx7"),
  totalRow           = wb$styles_mgr$get_dxf_id("dx6"),
  firstColumn        = wb$styles_mgr$get_dxf_id("dx5"),
  lastColumn         = wb$styles_mgr$get_dxf_id("dx4"),
  firstRowStripe     = wb$styles_mgr$get_dxf_id("dx3"),
  secondRowStripe    = wb$styles_mgr$get_dxf_id("dx2"),
  firstColumnStripe  = wb$styles_mgr$get_dxf_id("dx1"),
  secondColumnStripe = wb$styles_mgr$get_dxf_id("dx0")
)


wb$add_style(xml)

# create a table and apply the custom style
wb <- wb %>%
  wb_add_data_table(x = mtcars, tableStyle = "red_table")
```

11 Conditional Formatting

```
library(openxlsx2)
```

```
wb <- wb_workbook()
negStyle <- create_dxfs_style(font_color = wb_color(hex = "FF9C0006"), bgFill = wb_color(h
posStyle <- create_dxfs_style(font_color = wb_color(hex = "FF006100"), bgFill = wb_color(h
wb$styles_mgr$add(negStyle, "negStyle")
wb$styles_mgr$add(posStyle, "posStyle")
```

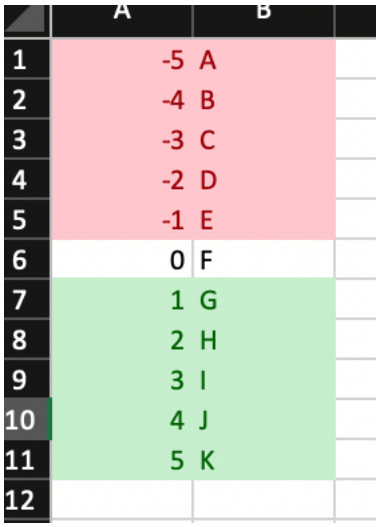
11.1 Rule applies to all each cell in range




```
wb$add_worksheet("cellIs")
wb$add_data("cellIs", -5:5)
wb$add_data("cellIs", LETTERS[1:11], startCol = 2)
wb$add_conditional_formatting(
  "cellIs",
  cols = 1,
```

```
  rows = 1:11,
  rule = "!=0",
  style = "negStyle"
)
wb$add_conditional_formatting(
  "cellIs",
  cols = 1,
  rows = 1:11,
  rule = "==0",
  style = "posStyle"
)
```

11.2 Highlight row dependent on first cell in row

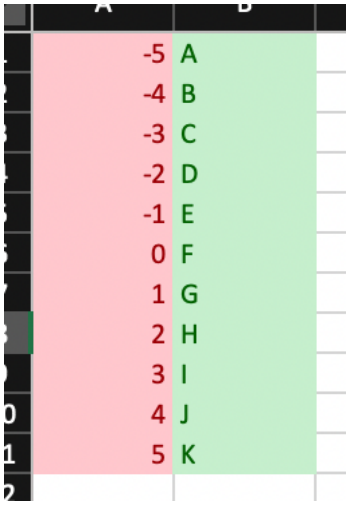


	A	B
1	-5	A
2	-4	B
3	-3	C
4	-2	D
5	-1	E
6	0	F
7	1	G
8	2	H
9	3	I
10	4	J
11	5	K
12		

```
wb$add_worksheet("Moving Row")
wb$add_data("Moving Row", -5:5)
wb$add_data("Moving Row", LETTERS[1:11], startCol = 2)
wb$add_conditional_formatting(
  "Moving Row",
  cols = 1:2,
  rows = 1:11,
  rule = "$A1<0",
  style = "negStyle"
)
```

```
wb$add_conditional_formatting(
  "Moving Row",
  cols = 1:2,
  rows = 1:11,
  rule = "$A1>0",
  style = "posStyle"
)
```

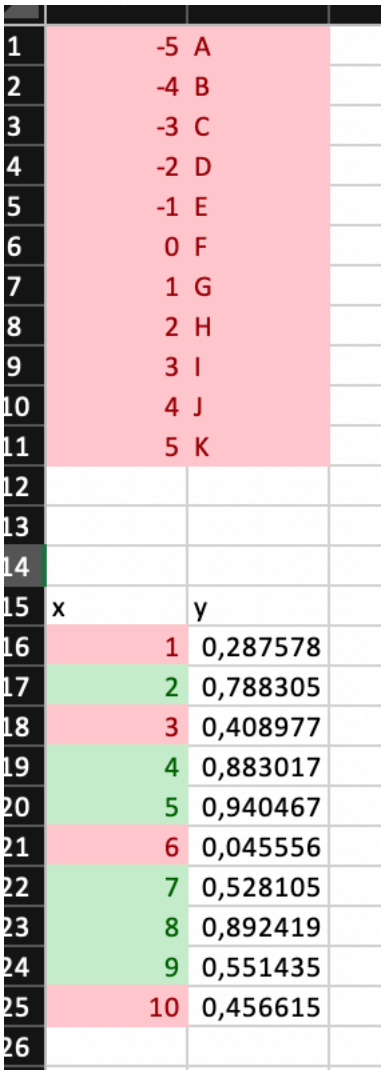
11.3 Highlight column dependent on first cell in column




```
wb$add_worksheet("Moving Col")
wb$add_data("Moving Col", -5:5)
wb$add_data("Moving Col", LETTERS[1:11], startCol = 2)
wb$add_conditional_formatting(
  "Moving Col",
  cols = 1:2,
  rows = 1:11,
  rule = "A$1<0",
  style = "negStyle"
)
wb$add_conditional_formatting(
  "Moving Col",
  cols = 1:2,
  rows = 1:11,
  rule = "A$1>0",
```

```
  style = "posStyle"
)
```

11.4 Highlight entire range cols X rows dependent only on cell A1



1	-5	A
2	-4	B
3	-3	C
4	-2	D
5	-1	E
6	0	F
7	1	G
8	2	H
9	3	I
10	4	J
11	5	K
12		
13		
14		
15	x	y
16	1	0,287578
17	2	0,788305
18	3	0,408977
19	4	0,883017
20	5	0,940467
21	6	0,045556
22	7	0,528105
23	8	0,892419
24	9	0,551435
25	10	0,456615
26		

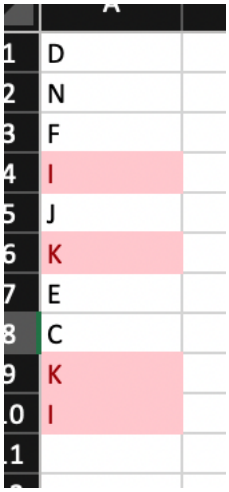
```
wb$add_worksheet("Dependent on")
wb$add_data("Dependent on", -5:5)
wb$add_data("Dependent on", LETTERS[1:11], startCol = 2)
wb$add_conditional_formatting(
```

```
  "Dependent on",
  cols = 1:2,
  rows = 1:11,
  rule = "$A$1 < 0",
  style = "negStyle"
)
wb$add_conditional_formatting(
  "Dependent on",
  cols = 1:2,
  rows = 1:11,
  rule = "$A$1>0",
  style = "posStyle"
)
```

11.5 Highlight cells in column 1 based on value in column 2

```
wb$add_data("Dependent on", data.frame(x = 1:10, y = runif(10)), startRow = 15)
wb$add_conditional_formatting(
  "Dependent on",
  cols = 1,
  rows = 16:25,
  rule = "B16<0.5",
  style = "negStyle"
)
wb$add_conditional_formatting(
  "Dependent on",
  cols = 1,
  rows = 16:25,
  rule = "B16>=0.5",
  style = "posStyle"
)
```

11.6 Highlight duplicates using default style



	A
1	D
2	N
3	F
4	I
5	J
6	K
7	E
8	C
9	K
10	I
11	

```
wb$add_worksheet("Duplicates")
wb$add_data("Duplicates", sample(LETTERS[1:15], size = 10, replace = TRUE))
wb$add_conditional_formatting(
  "Duplicates",
  cols = 1,
  rows = 1:10,
  type = "duplicatedValues"
)
```

11.7 Cells containing text

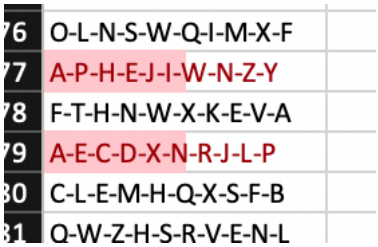
	A	B
1	D-L-N-S-G-I-V-B-P-M	
2	S-X-T-O-G-D-A-H-P-K	
3	P-T-H-C-D-Y-L-Q-J-K	
4	Y-W-H-N-U-M-B-K-V-Z	
5	F-Y-H-L-D-M-N-P-A-X	
6	H-J-Z-R-U-I-G-T-Y-K	
7	A-Y-S-J-U-M-K-T-G-I	
8	I-E-W-N-X-F-A-J-Q-R	
9	Z-U-G-Y-I-T-F-R-Q-E	
10	Y-T-C-N-A-B-D-J-V-E	

```
fn <- function(x) paste(sample(LETTERS, 10), collapse = "-")
wb$add_worksheet("containsText")
wb$add_data("containsText", sapply(1:10, fn))
wb$add_conditional_formatting(
  "containsText",
  cols = 1,
  rows = 1:10,
  type = "containsText",
  rule = "A"
)
wb$add_worksheet("notcontainsText")
```

11.8 Cells not containing text


```
fn <- function(x) paste(sample(LETTERS, 10), collapse = "-")
wb$add_data("notcontainsText", sapply(1:10, fn))
wb$add_conditional_formatting(
  "notcontainsText",
  cols = 1,
  rows = 1:10,
  type = "notContainsText",
  rule = "A"
)
```

11.9 Cells begins with text




```
fn <- function(x) paste(sample(LETTERS, 10), collapse = "-")
wb$add_worksheet("beginsWith")
wb$add_data("beginsWith", sapply(1:100, fn))
wb$add_conditional_formatting(
  "beginsWith",
  cols = 1,
  rows = 1:100,
  type = "beginsWith",
  rule = "A"
)
```

11.10 Cells ends with text


```
fn <- function(x) paste(sample(LETTERS, 10), collapse = "-")
wb$add_worksheet("endsWith")
wb$add_data("endsWith", sapply(1:100, fn))
wb$add_conditional_formatting(
  "endsWith",
  cols = 1,
  rows = 1:100,
  type = "endsWith",
  rule = "A"
```

```
)
```

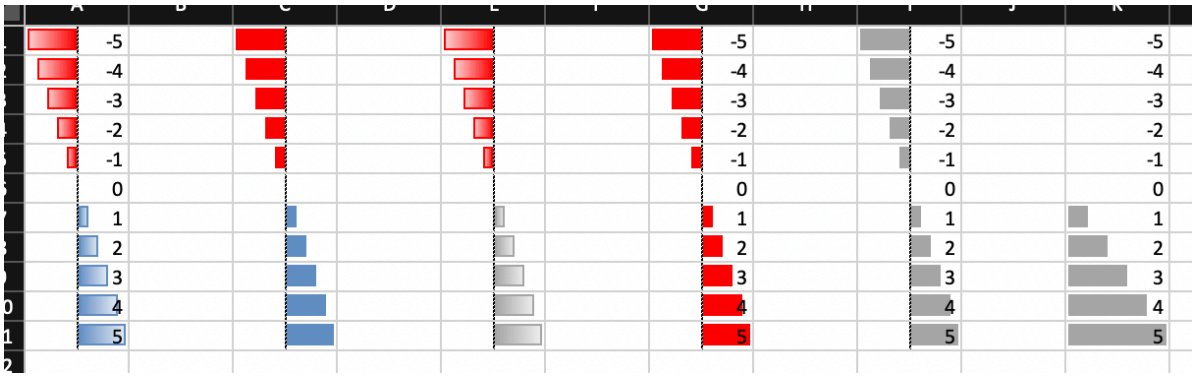
11.11 Colorscale colors cells based on cell value

```
df <- read_xlsx("https://github.com/JanMarvin/openxlsx-data/raw/main/readTest.xlsx", sheet
wb$add_worksheet("colorScale", zoom = 30)
wb$add_data("colorScale", df, colNames = FALSE) ## write data.frame
```

Rule is a vector or colors of length 2 or 3 (any hex color or any of `colors()`). If rule is `NULL`, min and max of cells is used. Rule must be the same length as style or L.

```
wb$add_conditional_formatting(
  "colorScale",
  cols = c(1, ncol(df)),
  rows = seq_len(nrow(df)),
  style = c("black", "white"),
  rule = c(0, 255),
  type = "colorScale"
)
wb$set_col_widths("colorScale", cols = seq_along(df), widths = 1.07)
wb$set_row_heights("colorScale", rows = seq_len(nrow(df)), heights = 7.5)
```

11.12 Databars




```
wb$add_worksheet("databar")
## Databars
```

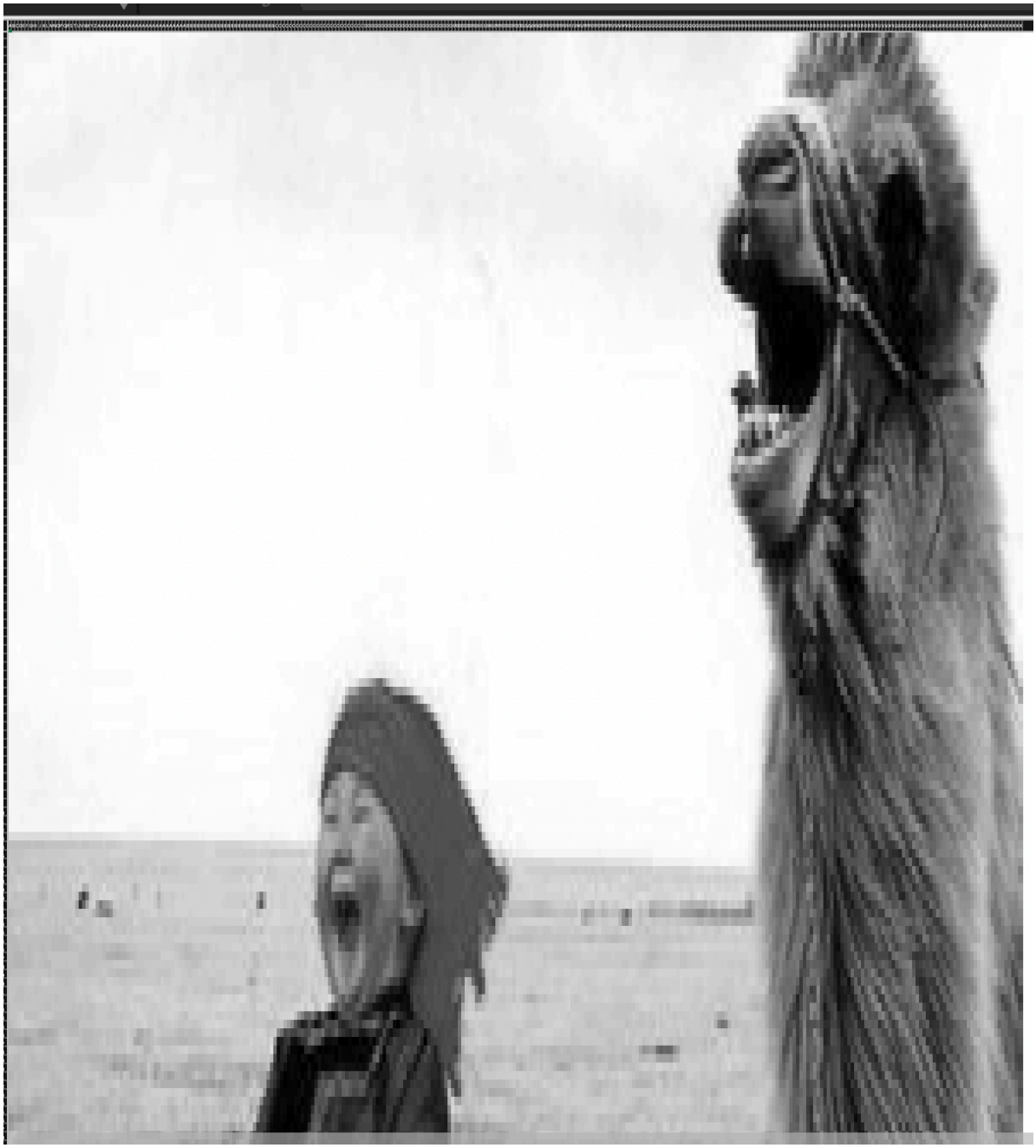
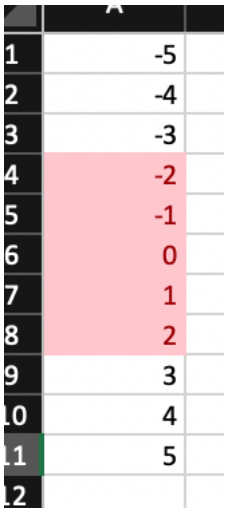


Figure 11.1: Yep, that is a color scale image.

```
wb$add_data("databar", -5:5, startCol = 1)
wb <- wb_add_conditional_formatting(
  wb,
  "databar",
  cols = 1,
  rows = 1:11,
  type = "dataBar"
) ## Default colors

wb$add_data("databar", -5:5, startCol = 3)
wb <- wb_add_conditional_formatting(
  wb,
  "databar",
  cols = 3,
  rows = 1:11,
  type = "dataBar",
  params = list(
    showValue = FALSE,
    gradient = FALSE
  )
) ## Default colors

wb$add_data("databar", -5:5, startCol = 5)
wb <- wb_add_conditional_formatting(
  wb,
  "databar",
  cols = 5,
  rows = 1:11,
  type = "dataBar",
  style = c("#a6a6a6"),
  params = list(showValue = FALSE)
)

wb$add_data("databar", -5:5, startCol = 7)
wb <- wb_add_conditional_formatting(
  wb,
  "databar",
  cols = 7,
  rows = 1:11,
  type = "dataBar",
  style = c("red"),
```

```
  params = list(
    showValue = TRUE,
    gradient = FALSE
  )
)

# custom color
wb$add_data("databar", -5:5, startCol = 9)
wb <- wb_add_conditional_formatting(
  wb,
  "databar",
  cols = 9,
  rows = 1:11,
  type = "dataBar",
  style = c("#a6a6a6", "#a6a6a6"),
  params = list(showValue = TRUE, gradient = FALSE)
)

# with rule
wb$add_data(x = -5:5, startCol = 11)
wb <- wb_add_conditional_formatting(
  wb,
  "databar",
  cols = 11,
  rows = 1:11,
  type = "dataBar",
  rule = c(0, 5),
  style = c("#a6a6a6", "#a6a6a6"),
  params = list(showValue = TRUE, gradient = FALSE)
)
```

11.13 Between

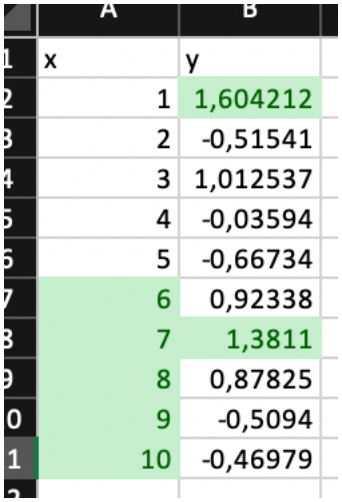


	A
1	-5
2	-4
3	-3
4	-2
5	-1
6	0
7	1
8	2
9	3
10	4
11	5
12	

Highlight cells in interval [-2, 2]

```
wb$add_worksheet("between")
wb$add_data("between", -5:5)
wb$add_conditional_formatting(
  "between",
  cols = 1,
  rows = 1:11,
  type = "between",
  rule = c(-2, 2)
)
wb$add_worksheet("topN")
```

11.14 Top N



	A	B
1	x	y
2	1	1,604212
3	2	-0,51541
4	3	1,012537
5	4	-0,03594
6	5	-0,66734
7	6	0,92338
8	7	1,3811
9	8	0,87825
10	9	-0,5094
11	10	-0,46979

```
wb$add_data("topN", data.frame(x = 1:10, y = rnorm(10)))
```

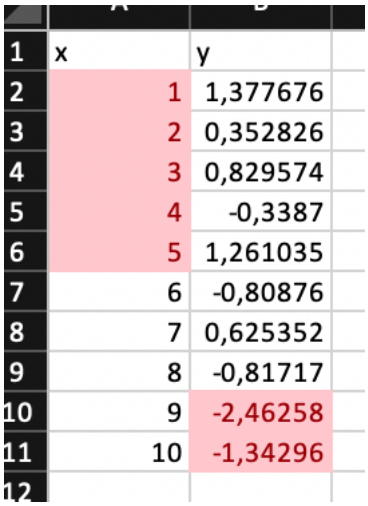
Highlight top 5 values in column x

```
wb$add_conditional_formatting(
  "topN",
  cols = 1,
  rows = 2:11,
  style = "posStyle",
  type = "topN",
  params = list(rank = 5)
)
```

Highlight top 20 percentage in column y

```
wb$add_conditional_formatting(
  "topN",
  cols = 2,
  rows = 2:11,
  style = "posStyle",
  type = "topN",
  params = list(rank = 20, percent = TRUE)
)
wb$add_worksheet("bottomN")
```

11.15 Bottom N



	x	y
1		
2	1	1,377676
3	2	0,352826
4	3	0,829574
5	4	-0,3387
6	5	1,261035
7	6	-0,80876
8	7	0,625352
9	8	-0,81717
10	9	-2,46258
11	10	-1,34296
12		

```
wb$add_data("bottomN", data.frame(x = 1:10, y = rnorm(10)))
```

Highlight bottom 5 values in column x

```
wb$add_conditional_formatting(
  "bottomN",
  cols = 1,
  rows = 2:11,
  style = "negStyle",
  type = "bottomN",
  params = list(rank = 5)
)
```

Highlight bottom 20 percentage in column y

```
wb$add_conditional_formatting(
  "bottomN",
  cols = 2,
  rows = 2:11,
  style = "negStyle",
  type = "bottomN",
  params = list(rank = 20, percent = TRUE)
)
wb$add_worksheet("logical operators")
```

11.16 Logical Operators

	A
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	

You can use Excels logical Operators

```
wb$add_data("logical operators", 1:10)
wb$add_conditional_formatting(
  "logical operators",
  cols = 1,
  rows = 1:10,
  rule = "OR($A1=1,$A1=3,$A1=5,$A1=7)"
)
```

12 charts

The following manual will present various ways to add plots and charts to `openxlsx2` worksheets and even chartsheets. This assumes that you have basic knowledge how to handle `openxlsx2` and are familiar with either the default `R graphics` functions like `plot()` or `barplot()` and `grDevices`, or with the packages `{ggplot2}`, `{rvg}` or `{mschart}`. There are plenty of other manuals that cover using these better than we could ever tell you to.

```
library(openxlsx2) # openxlsx2 >= 0.4 for mschart and rvg support

## create a workbook
wb <- wb_workbook()
```

12.1 Add plot to workbook

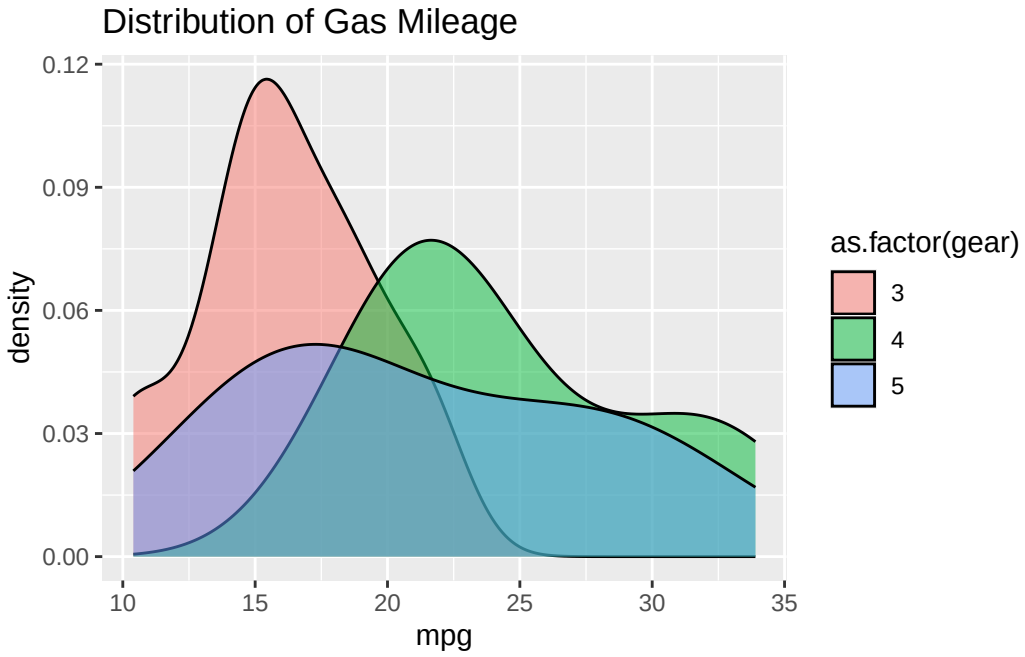
You can include any image in PNG or JPEG format. Simply open a device and save the output and pass it to the worksheet with `wb_add_image()`.

```
myplot <- tempfile(fileext = ".jpg")
jpeg(myplot)
print(plot(AirPassengers))
#> NULL
dev.off()
#> pdf
#>   2

# Add basic plots to the workbook
wb$add_worksheet("add_image")$add_image(file = myplot)
```

12.2 Add `{ggplot2}` plot to workbook

You can include `{ggplot2}` plots similar to how you would include them with `openxlsx`. Call the plot first and afterwards use `wb_add_plot()`.

```r
if (requireNamespace("ggplot2")) {

library(ggplot2)

print(ggplot(mtcars, aes(x = mpg, fill = as.factor(gear))) +
  ggtitle("Distribution of Gas Mileage") +
  geom_density(alpha = I(.5)))

# Add ggplot to the workbook
wb$add_worksheet("add_plot")$
  add_plot(width = 5, height = 3.5, fileType = "png", units = "in")

}
#> Loading required namespace: ggplot2
#> Loading required namespace: testthat
```



12.3 Add plot via {rvg}

If you want vector graphics that can be modified in spreadsheet software the `dml_xlsx()` device comes in handy. You can pass the output via `wb_add_drawing()`.

```
if (requireNamespace("ggplot2") && requireNamespace("rvg")) {

library(rvg)

## create rvg example
tmp <- tempfile(fileext = ".xml")
dml_xlsx(file =  tmp, fonts = list(sans = "Bradley Hand"))
print(ggplot(data = iris,
       mapping = aes(x = Sepal.Length, y = Petal.Width)) +
  geom_point() + labs(title = "With font Bradley Hand") +
  theme_minimal(base_family = "sans", base_size = 18))
dev.off()

# Add rvg to the workbook
wb$add_worksheet("add_drawing")$
  add_drawing(xml = tmp)$
  add_drawing(xml = tmp, dims = NULL)

}
#> Loading required namespace: rvg
```

12.4 Add {mschart} plots

If you want native open xml charts, have a look at {mschart}. Create one of the chart files and pass it to the workbook with wb_add_mschart(). There are two options possible. 1. Either the default {mschart} output identical to the one in {officer}. Passing a data object and let {mschart} prepare the data. In this case wb_add_mschart() will add a new data region. 2. Passing a wb_data() object to {mschart}. This object contains references to the data on the worksheet and allows using data "as is".

```
if (requireNamespace("mschart")) {

library(mschart) # mschart >= 0.4 for openxlsx2 support

## create chart from mschart object (this creates new input data)
mylc <- ms_linechart(
  data = browser_ts,
  x = "date",
  y = "freq",
  group = "browser"
```

```
)

wb$add_worksheet("add_mschart")$add_mschart(dims = "A10:G25", graph = mylc)


## create chart referencing worksheet cells as input
# write data starting at B2
wb$add_worksheet("add_mschart - wb_data")$
  add_data(x = mtcars, dims = "B2")$
  add_data(x = data.frame(name = rownames(mtcars)), dims = "A2")

# create wb_data object this will tell this mschart
# from this PR to create a file corresponding to openxlsx2
dat <- wb_data(wb, dims = "A2:G10")

# create a few mscharts
scatter_plot <- ms_scatterchart(
  data = dat,
  x = "mpg",
  y = c("disp", "hp")
)

bar_plot <- ms_barchart(
  data = dat,
  x = "name",
  y = c("disp", "hp")
)

area_plot <- ms_areachart(
  data = dat,
  x = "name",
  y = c("disp", "hp")
)

line_plot <- ms_linechart(
  data = dat,
  x = "name",
  y = c("disp", "hp"),
  labels = c("disp", "hp")
)
```

```r
# add the charts to the data
wb <- wb %>%
  wb_add_mschart(dims = "F4:L20", graph = scatter_plot) %>%
  wb_add_mschart(dims = "F21:L37", graph = bar_plot) %>%
  wb_add_mschart(dims = "M4:S20", graph = area_plot) %>%
  wb_add_mschart(dims = "M21:S37", graph = line_plot)

# add chartsheet
wb <- wb %>%
  wb_add_chartsheet() %>%
  wb_add_mschart(graph = scatter_plot)

}
#> Loading required namespace: mschart
```

13 Pivot tables

```
wb <- wb_workbook()$
  add_worksheet()$
  add_data(x = esoph)

df <- wb_data(wb)

wb$add_pivot_table(df, rows = "agegp", cols = "tobgp", data = c("ncontrols"))
wb$add_pivot_table(df, rows = "agegp", data = c("ncontrols", "ncases"))
wb$add_pivot_table(df, rows = "agegp", cols = "tobgp", data = c("ncontrols", "ncases"))
```

```
wb <- wb_workbook()$
  add_worksheet()$
  add_data(x = mtcars)

df <- wb_data(wb)

wb$add_pivot_table(df, dims = "A1", rows = "cyl", cols = "gear", data = c("disp", "hp"))
wb$add_pivot_table(df, dims = "A10", sheet = 2, rows = "cyl", cols = "gear", data = c("dis
wb$add_pivot_table(df, dims = "A20", sheet = 2, rows = "cyl", cols = "gear", data = c("dis
wb$add_pivot_table(df, dims = "A30", sheet = 2, rows = "cyl", cols = "gear", data = c("dis
```

```
## Pivot table example 1
wb <- wb_workbook() %>% wb_add_worksheet() %>% wb_add_data(x = mtcars, inline_strings = F)

df <- wb_data(wb)

# basic pivot table with filter, rows, cols and data
wb$add_pivot_table(df, dims = "A3", filter = "mpg", rows = "cyl", cols = "gear", data = "d

# same pivot table, but with "count" instead of "sum" and no style
wb$add_pivot_table(df, dims = "A10", sheet = 2, rows = "cyl", cols = "gear", data = c("dis

# nested pivot table with two variables for column, row and data and two different functio
```

```
# uses an autoformatid (not that I like it, just because I can do it)
wb$add_pivot_table(df, dims = "A20", sheet = 2, rows = c("cyl", "mpg"), cols = c("vs","gea
                   params = list(applyAlignmentFormats   = "1",
                                 applyNumberFormats      = "1",
                                 applyBorderFormats      = "1",
                                 applyFontFormats        = "1",
                                 applyPatternFormats     = "1",
                                 applyWidthHeightFormats = "1",
                                 autoFormatId = "4099"))

# multiple filters on a pivot table
wb$add_pivot_table(df, dims = "A3", filter = c("am", "vs", "mpg", "hp", "wt"), rows = "cyl

# using custom caption
wb$add_pivot_table(df, dims = "A20", sheet = 3, rows = "cyl", cols = "gear", data = c("dis

# wb$open()
```

```
## Pivot table example 2
# pivot table with blanks and character variables on column and row
wb <- wb_workbook()$add_worksheet()$add_data(x = esoph)
df <- wb_data(wb, dims = "A1:E95")
wb$add_pivot_table(df, rows = "agegp", cols = "tobgp", data = c("ncontrols"))
# wb$open()
```

```
# original pivot table as reference
library(pivottabler)

pt <- PivotTable$new()
pt$addData(bhmtrains)
pt$addColumnDataGroups("TrainCategory")
pt$addRowDataGroups("TOC",
                    outlineBefore=list(isEmpty=FALSE, groupStyleDeclarations=list(color="b
                    outlineTotal=list(isEmpty=FALSE, groupStyleDeclarations=list(color="bl
pt$addRowDataGroups("PowerType", addTotal=FALSE)
pt$defineCalculation(calculationName="TotalTrains", summariseExpression="n()")
# pt$renderPivot() # does not render in quarto?

# use A:P
wb <- wb_workbook()$add_worksheet()$add_data(x = bhmtrains, na.strings = NULL)
```

```r
df <- wb_data(wb, dims = "A:P")

# use TrainCategory on column and data
wb$add_pivot_table(
  df,
  rows = c("TOC", "PowerType"),
  cols = "TrainCategory",
  data = "TrainCategory",
  fun = "count"
)
# wb$open()
```

References

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