Writing Reproducible Reports and Articles with Quarto

Christopher T. Kenny
Data-Driven Social Science

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DATA-DRIVEN SOCIAL SCIENCE
PRINCETON UNIVERSITY

Today's Plan

- What is Quarto?
- Including Text, Tables, and Figures
- Including Code
- Quarto Extensions
- Academic Websites
- Resources

What is Quarto?

What is Quarto?

- Publishing system based on Pandoc
  - Input a markdown document, render to anything supported by Pandoc
    - HTML, PDF, Word, Beamer, GFM, MediaWiki, etc.
- Built by Posit, PBC (formerly RStudio)
- Syntax builds on RMarkdown, but language agnostic
  - Existing `.Rmd` files and most Jupyter notebooks can be run by Quarto
- Reproducible system to combine code and text together

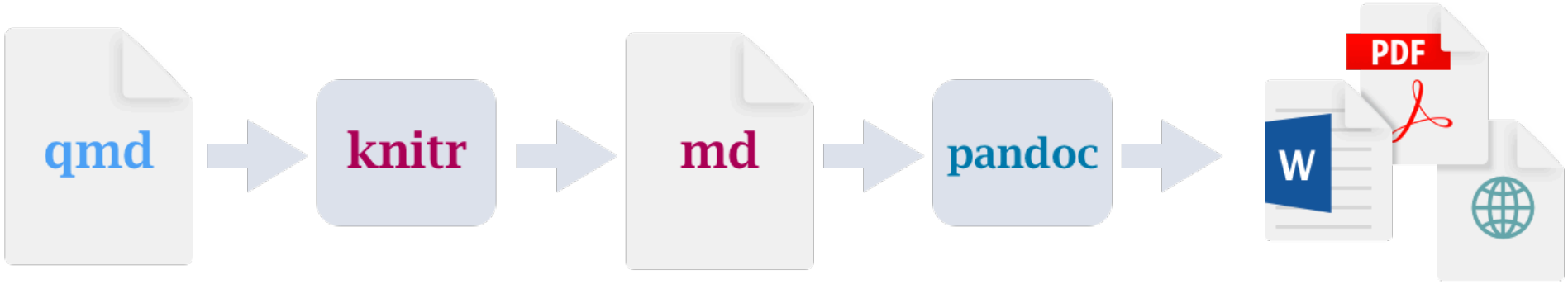


Figure from https://quarto.org/docs/faq/rmarkdown.html

The .qmd file

Two main components:

1. YAML header
    1. Specify title, authors, and frontmatter
    2. Identify output type (e.g., PDF, PowerPoint, HTML)
    3. Style the document (e.g., pick fonts `mainfont: Libre Franklin`)
2. Body
    1. Contains text
    2. Include LaTeX equations `$x^2$` becomes x^2
    3. Write code chunks in R, Python, Julia, Observable, etc.
    4. Include raw chunks with format-specific code (e.g., HTML or Typst blocks)

Why Quarto?

- Common input format for many output types
- Many journal templates for general and social sciences
  - Lowers the barrier on resubmitting elsewhere
- Reproducible writing
  - Avoid copying data or hard-coding statistics
  - Place code + text together
- Write in Markdown instead of LaTeX (or Typst or HTML ...)
- Markdown formats work well with version control

Output formats

- Articles: PDF (LaTeX, Typst), Word
- Slides: Beamer, RevealJS, PowerPoint
- Websites: Dashboards, Static HTML, or Shiny
- Books: PDF and HTML
- All other formats supported by Pandoc (e.g., Wiki, Markdown, JATS, InDesign, ePub)

Selected academic journal templates

- General science: Science, Nature, PNAS, PLOS
- Major publishers: Taylor and Francis, Cambridge University Press, Springer, Elsevier
- Social sciences: Annual Reviews, APSR, BJPS, PA, PSRM, Perspectives, APA, and more

Including Text, Tables, and Figures

Writing 101 in Quarto

Quarto builds on Pandoc's flavor of Markdown

- Code blocks are fenced with backticks `` `code` `` becomes `code`
- Italics with `*italics*`
- Bold with `**bold**`
- Headers with `# Header Level 1`, `## Header Level 2`, etc.
- Lists with `- item` or `1. item`
- Links with `[text](url)` or `<url>`
- LaTeX math with `$math$` for inline or `$$math$$` for display
- Reference figures, tables, and sections with `@fig-label`, `@tbl-label`, and `@sec-label`
- Reference citations with `[@citation]` for parenthetical or `@citation` for prose

Bibliographies

- Quarto supports `.bib`/`.bibtex`, CSL `.json`/`.yaml`, and `.ris` bibliography files.
- Can be styled with CSL for all formats
- Additional customization available for LaTeX: natbib, biber, biblatex
- Can also use Pandoc's implementation of CiteProc
  - Similar to the citation system in Word

Including figures

Basic figures can be included with `![]()` syntax:

```
![Caption](DDSS-stacked_PU_shield_black.png)
```

Figure 1: Caption

Including Subfigures

```
::: {#fig-subfig layout-ncol=2}

![A](DDSS-stacked_PU_shield_black.png)

![B](DDSS-stacked_PU_shield_black.png)

More Captions

:::
```

(a) A

(b) B

Figure 1: More Captions

Making a table

Tables use “pipe” syntax:

```
| University |  Color  |
|:-----------|--------:|
| Princeton  | #E98338 |
| Harvard    | #A51C30 |
| Cornell    | #B31B1B |
| Brown      | #ED1C24 |

: Red and orange university colors {#tbl-colors}
```

University	Color
Princeton	#E98338
Harvard	#A51C30
Cornell	#B31B1B
Brown	#ED1C24

Red and orange university colors

Raw Content

Raw content (e.g. HTML in a webpage) can be included with a special block:

````
```{=typst}
#set text(fill: blue)
Some example text.
```
````

Some example text.

Including Code

Supported Languages

Quarto supports code execution in multiple languages:

- R: Native support with knitr engine
- Python: Native support via Jupyter
- Julia: Support via Jupyter or new `julia` engine!
- Observable JS: Standalone support for interactive graphs
- Other languages: Any language with a Jupyter kernel (e.g., Stata)
  - I have heard that this works surprisingly well!
- Other languages: Custom support via knitr for select languages (e.g., `rust` via `rextendr`)

Control code chunk behavior with options:

- `#| echo: false` - Hide code, show output only
- `#| eval: false` - Show code but don't run it
- `#| warning: false` / `message: false` - Suppress warnings or messages
- `#| fig-width: 8` / `#| fig-height: 6` - Control figure dimensions
- `#| label: fig-myplot` - Add cross-reference labels
- `#| cache: true` - Cache expensive computations

Quarto Extensions

Quarto Extensions

Extend Quarto's functionality with extensions:

- Formats: Custom output formats (e.g., journal templates, custom PDFs)
- Filters: Modify document processing (e.g., add custom syntax)
- Shortcodes: Reusable content snippets (`{{< video ... >}}`, `{{< include ... >}}`)
- Revealjs plugins: Enhanced slide presentations

Install with: `quarto add username/extension-name`

brand.yml

Centralized brand configurations

Define once, apply everywhere:

- Colors (primary, secondary, palettes)
- Typography (fonts, sizes)
- Logos and images
- Apply across HTML, PDFs, slides, websites

Example: christopherkenny/princeton-brand.yml

```yaml
meta:
  name:
    full: Princeton University
    short: Princeton
  link:
    home: https://www.princeton.edu/
    twitter: https://x.com/Princeton
    linkedin: https://www.linkedin.com/school/princeton-university/
    facebook: https://www.facebook.com/PrincetonU/
  founded: 1746

color:
  palette:
    princeton-orange: "#e98338"
```

```
    deep-blue: "#092264"

typography:
  fonts:
    - family: "Princeton Monticello Display"
      source: file
      files:
        - path: https://drive.google.com/file/d/19HUJ52fQbbQtvuUKUV5h0hJtaf6
NJIUQ
          weight: regular

logo:
  images:
    primary:
      path: assets/PU_mark.png
```

Workflow for academic writing:

1. Start with a preprint template: `quarto use template christopherkenny/ctk-article`
2. Write the paper in Markdown with embedded code
3. Switch to a journal template: `quarto use template quarto-journals/jss`
4. Add any journal-specific things to the header
5. Render to PDF: `quarto render manuscript.qmd`
6. Submit generated PDF (+ source files)
7. Get desk rejected
8. Reformat by importing next template `quarto add template christopherkenny/nature`

Partials

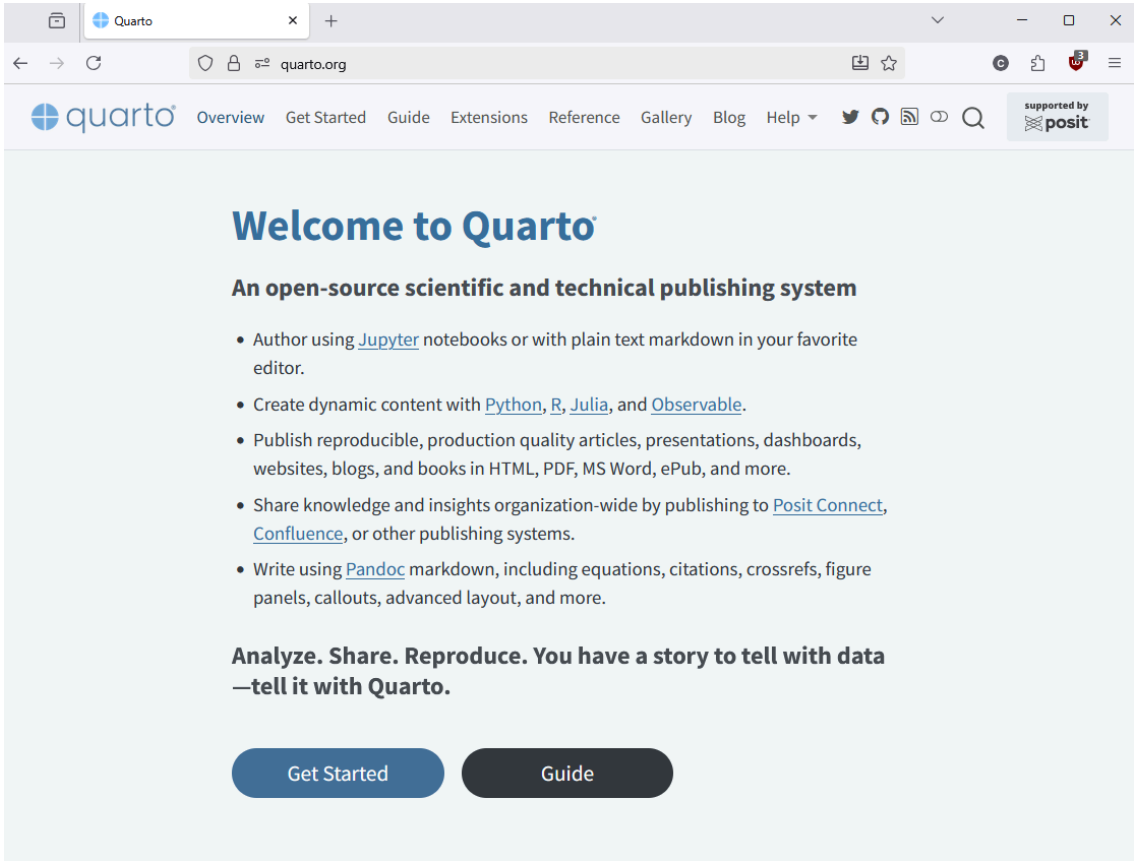
- How it all works: partial files
- One core template file includes 4-15 subparts
  - Each subfile = a partial
- Edit the partials you need, use the defaults for the rest
- Partials are broken into meaningful components
  - Title, abstract, figure formatting, etc
- Easy to use formats (e.g., Typst) have simple partials
- Complex formats (e.g., HTML, LaTeX, revealjs) break out more pieces

Academic Websites

```
quarto create project
```

Resources

Quarto Documentation



Quarto Extensions

Extensions are a powerful way to modify and extend the behavior of Quarto. Below is a listing of available extensions (please let us know if you have an extension you'd like to see added to the list).

See the articles on Creating Extensions to learn how to develop your own extensions.

Resources

Using or making filters https://quarto.org/docs/extensions/filters.html

Shortcodes https://quarto.org/docs/authoring/shortcodes.html

Interactivity: Observable or Shiny https://quarto.org/docs/interactive/

Making your own extensions https://christophertkenny.com/posts/2023-07-01-creating-quarto-journal-articles/ and https://quarto.org/docs/extensions/

These Slides

Written in Quarto

Using Typst + Polylux via `christopherkenny/projector`

Source available:

https://github.com/christopherkenny/quarto-workshop-fall2025/blob/main/quarto-workshop-fall2025.qmd