

Module 1 - Lesson 01

History and Importance of Reproducibility and Transparency

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Outline

- Timeline Reproducible Research & Transparency
- People
- Books
- Literate Programming > Dynamic Documentation > [R]Markdown
- The Big Picture

Timeline Reproducible Research & Transparency

YEAR	Event
1992	Jon Claerbout coined the term "reproducible research" in his book "EARTH SOUNDINGS ANALYSIS: Processing versus Inversion (PVI)" ¹
1996	CONSORT statement introduced standards for reporting clinical trials ²
2004	International Committee of Medical Journal Editors (ICMJE) stated they would not publish a clinical trial that had not been registered. ³
2005	Ioannidis, J. P. A. Why most published research findings are false. PLoS Med. 2, e124 (2005) ⁴

1. <http://sepwww.stanford.edu/sep/jon/reproducible.html>

2. Begg C, Cho M, Eastwood S, Horton R, Moher D, Olkin I, Pitkin R, Rennie D, Schulz KF, Simel D, Stroup DF (1996). Improving the quality of reporting of randomized controlled trials. The CONSORT statement. JAMA 276:637-639.

3. http://www.icmje.org/news-and-editorials/update_2005.html

4. <https://doi.org/10.1371/journal.pmed.0020124>

Timeline Reproducible Research & Transparency

YEAR	Event
2007	FDA Amendments Act (FDAAA) required more types of clinical trials to be registered (final rules took effect January 2017) ⁵
2009	Journal of Biostatistics institutes policy to work with authors to publish articles that meet a standard of reproducibility. ⁶
2011	Alsheikh-Ali, et.al. (2011), report the low percentage of researchers satisfying the policies regarding the availability and sharing of their data. ⁷

5. <https://clinicaltrials.gov/ct2/manage-recs/fdaaa>

6. <https://academic.oup.com/biostatistics/article/10/3/405/293660/Reproducible-research-and-Biostatistics> & https://academic.oup.com/biostatistics/pages/General_Instructions

7. Alsheikh-Ali, A. A., Qureshi, W., Al-Mallah, M. H. & Ioannidis, J. P. Public availability of published research data in high-impact journals. PLoS ONE 6, e24357, 2011; <https://doi.org/10.1371/journal.pone.0024357>

Timeline Reproducible Research & Transparency

YEAR	Event
2012	Begley and Ellis reviewed 53 "landmark" studies and only 6 (11%) had the scientific findings confirmed. ⁸
2013	Center for Open Science launches & by 2014 the Open Science Framework has 7000 users with more than 45,000+ and over 15 institutions by 2017 ⁹
2014	NIH publishes their guidelines for addressing reproducibility ¹⁰
2015	The Open Science Collaboration reports that they were only able to replicate between 1/3 to 1/2 of the results from 100 studies ¹¹

8. <http://www.nature.com/nature/journal/v483/n7391/full/483531a.html>

9. <https://cos.io/about/brief-history-cos-2013-2017/> & <https://osf.io/>

10. <https://www.nih.gov/research-training/rigor-reproducibility>

11. Science, 28 Aug 2015: Vol. 349, Issue 6251, aac4716; DOI: 10.1126/science.aac4716; <http://science.sciencemag.org/content/349/6251/aac4716>

People

- Victoria Stodden <https://ischool.illinois.edu/people/faculty/vcs>
 - presentation on History of the Reproducibility Movement
<https://web.stanford.edu/~vcs/talks/ICERM-Dec102012STODDEN.pdf>
- Roger Peng <http://www.biostat.jhsph.edu/~rpeng/index.html>
- John P.A. Ioannidis <https://profiles.stanford.edu/john-ioannidis?tab=publications>
- Christopher Gandrud <https://www.iq.harvard.edu/people/christopher-gandrud>

Books on Reproducibility and Tools of the Trade

Image

Book



Implementing Reproducible Research by Victoria Stodden, Friedrich Leisch, Roger D. Peng <https://www.crcpress.com/Implementing-Reproducible-Research/Stodden-Leisch-Peng/p/book/9781466561595>



Dynamic Documents with R and knitr (Chapman & Hall/CRC The R Series) 1st Edition by Yihui Xie <https://www.crcpress.com/Dynamic-Documents-with-R-and-knitr/Xie/p/book/9781482203530>



bookdown: Authoring Books and Technical Documents with R Markdown by Yihui Xie <https://www.crcpress.com/bookdown-Authoring-Books-and-Technical-Documents-with-R-Markdown/Xie/p/book/9781138700109> & read online <https://bookdown.org/yihui/bookdown/>

more books

Image



Jennifer (Jenny)
Bryan

Book

Happy Git and GitHub for the useR by Jenny Bryan; read online
<http://happygitwithr.com/>



Using R and RStudio for Data Management, Statistical Analysis, and Graphics,
Second Edition by Nicholas J. Horton & Ken Kleinman; also see [Project MOSAIC](http://mosaic-web.org/),
<http://mosaic-web.org/>



ModernDive: An Introduction to Statistical and Data Sciences via R by Chester
Ismay and Albert Y. Kim; read online <https://ismayc.github.io/moderndiver-book/> &
Getting used to R, RStudio, and R Markdown by Chester Ismay
<https://ismayc.github.io/rbasics-book/>

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... and lots more ... see <https://bookdown.org/>

Literate Programming > Dynamic Documentation

> [R]Markdown

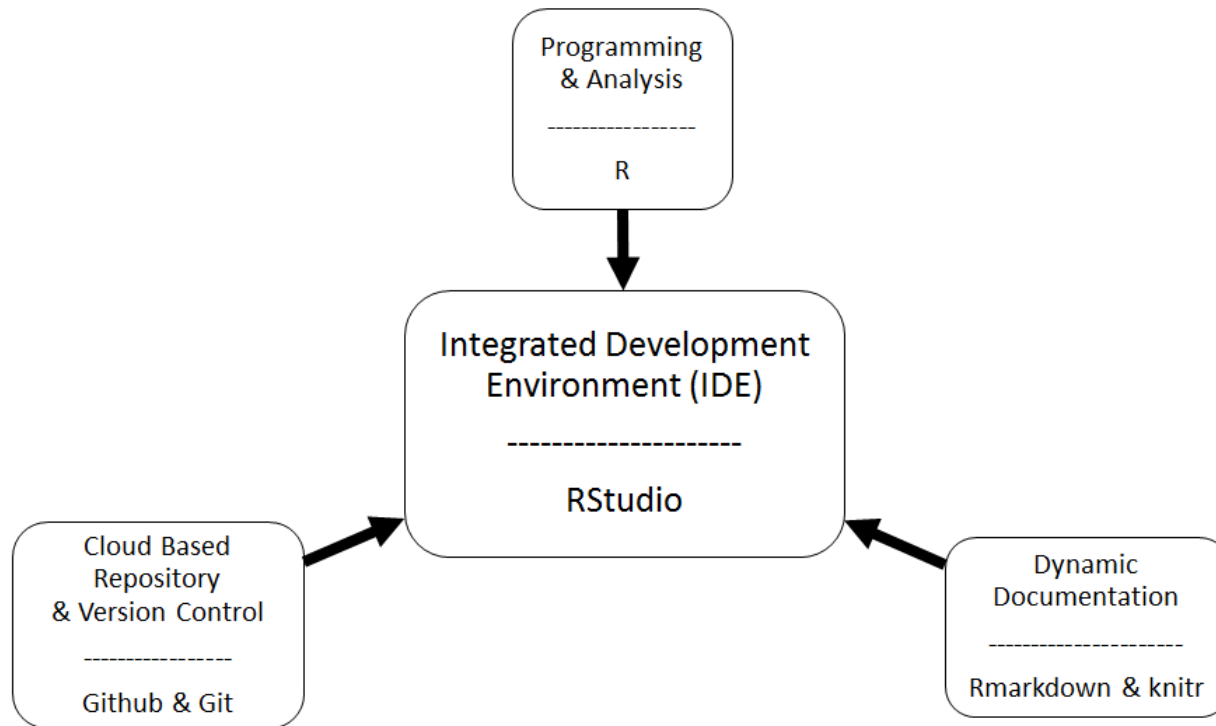
YEAR	Event
1992	"Literate Programming" is introduced by Donald Knuth as "that (which) combines a programming language with a documentation language, thereby making programs more robust, more portable, more easily maintained, and arguably more fun to write than programs that are written only in a high-level language. The main idea is to treat a program as a piece of literature, addressed to human beings rather than to a computer." http://www-cs-faculty.stanford.edu/~knuth/lp.html
2002	Friedrich Leisch introduces SWEAVE a program for "Dynamic generation of statistical reports using literate data analysis" https://leisch.userweb.mwn.de/Sweave/

Literate Programming > Dynamic Documentation

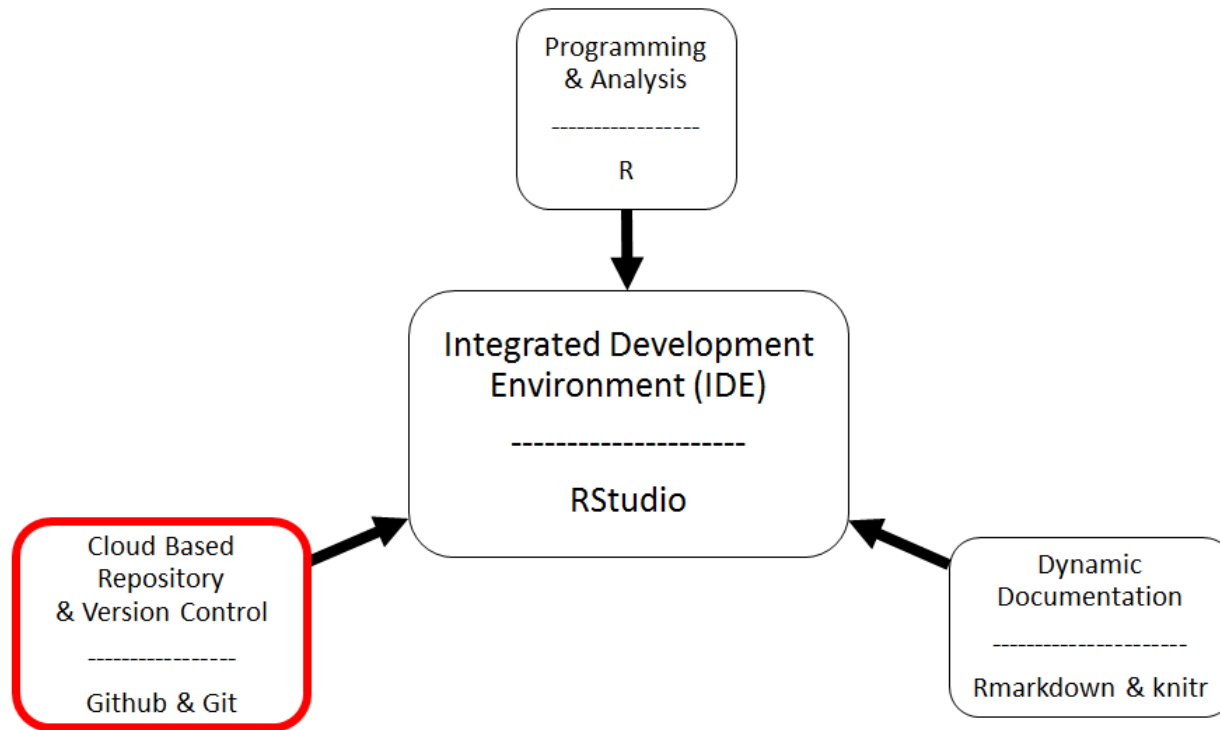
> [R]Markdown

YEAR	Event
2004	John Gruber created the Markdown language in 2004 in collaboration with Aaron Swartz - their goal was to "write using an easy-to-read, easy-to-write plain text format, and optionally convert it to structurally valid XHTML (or HTML)" https://daringfireball.net/projects/markdown/
2012	Yihui Xie releases knitr R package released - knitr was inspired by SWEAVE
2014	rmarkdown R package released - extends Markdown to work with R/RStudio environment

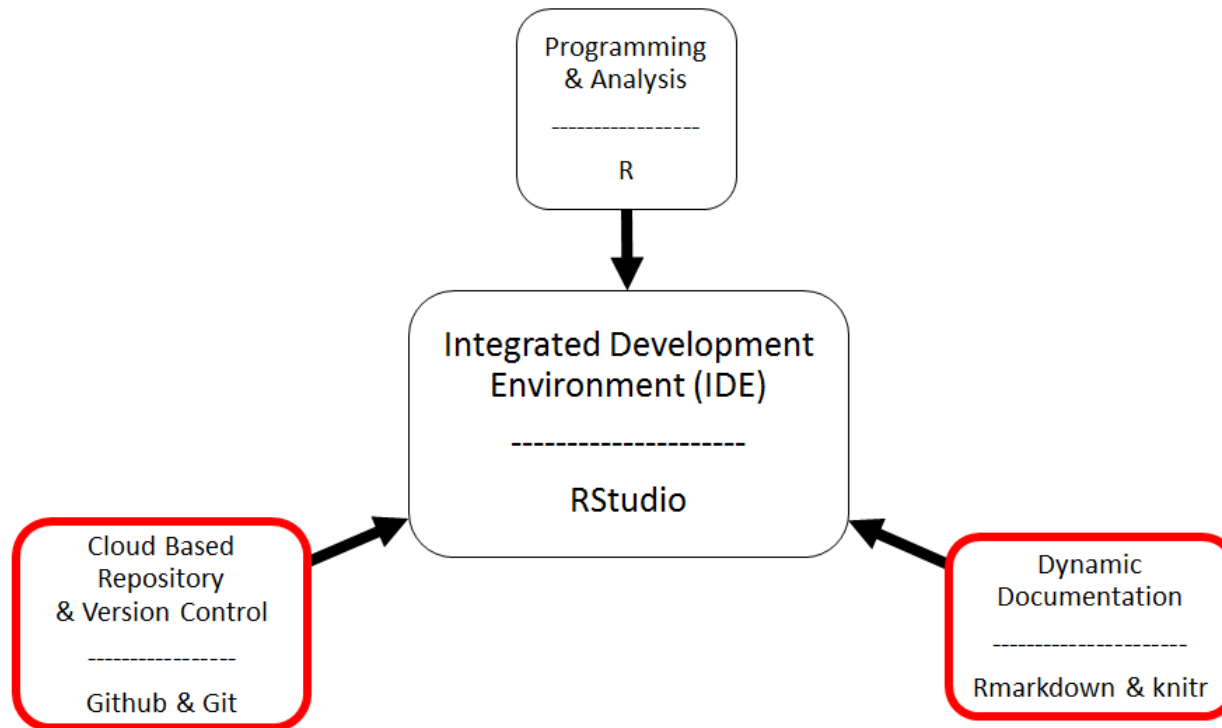
The Big Picture



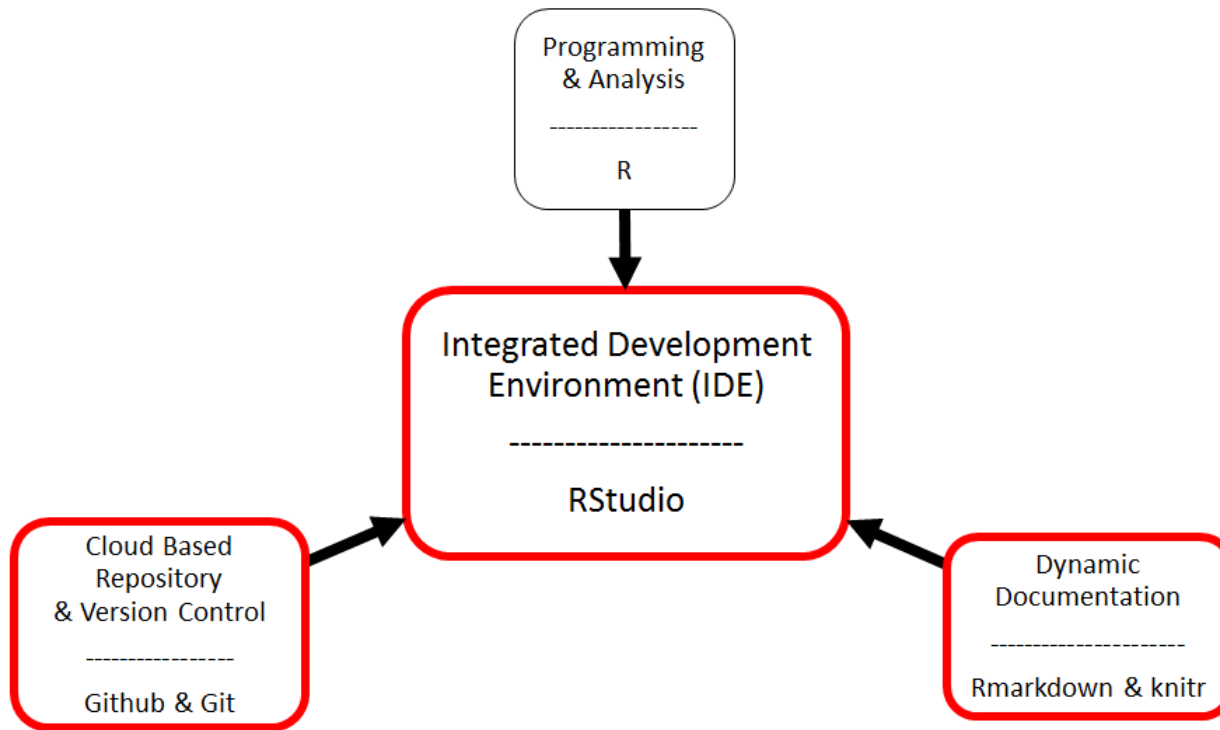
The Big Picture



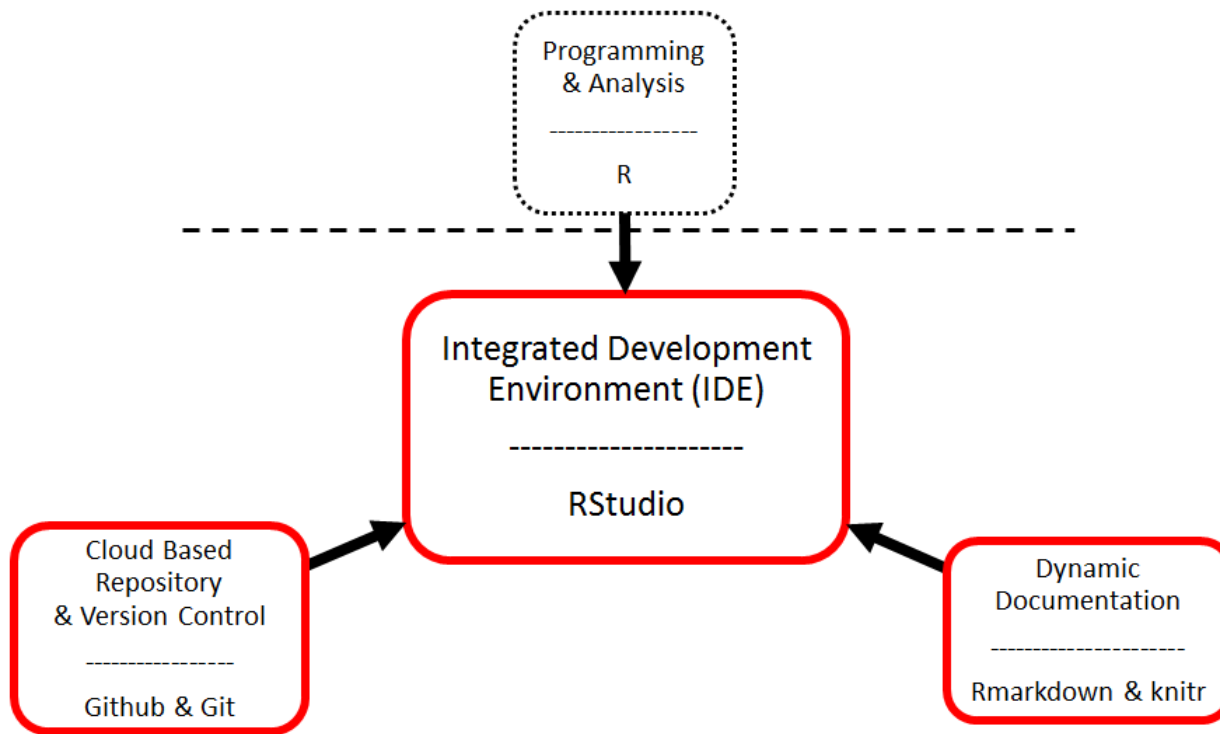
The Big Picture



The Big Picture



The Big Picture



Next in Lesson 02 ...

Getting Started with



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