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Using R Shiny for efficient scalability and multi-team projects

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1 December 2021

1

Overview

1. Learning R and Shiny
   - How long will it take to upskill myself and/or my team?
2. Organizing and developing R and R Shiny models
   - Tips for developing scalable models
   - Suggested workflow
3. How to work within a team
   - Version control
4. How to share and deploy models
   - Comparing three most common methods for online deployment
5. Poll: What most inhibits you from using R Shiny more?

2

How long will it take to upskill myself and/or my team?

The time needed to learn R with Shiny primarily depends on:

- Baseline technical level and expertise
- Time allocated for learning

This will vary from person to person:

Experience	Rose Hart	Rob Smith	Paul Schneider	Gianluca Baio
Baseline experience	VBA®	Stata® & VBA	SPSS®	Matlab®, SAS® and SPSS
From baseline to first R model (or proficiency)	4 months (Made large CE R Shiny app model to learn R)	3 months of dabbling then 5 weeks adapting a model	2 months to learn the basics	2 months to learn the basics
Time taken to additionally learn Shiny	N/A – R and Shiny learned concurrently	First app was an intense 3-week project. I still learn something new every day I use Shiny ☺	After 2–3 years' use: 1st Shiny app: 1 week 1st CEM app: 3 weeks	1 month
Average proportion of working week used for learning	60%	25%	50%	40%

BresMed **Key:** CE, cost-effectiveness; CEM, cost-effectiveness model; VBA, Visual Basic for Applications.

3

3

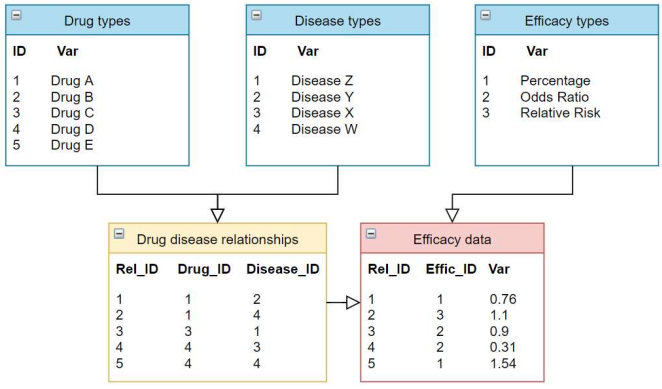
Organizing and developing R and R Shiny models

Economic models can become very large, and data and workflow organization is key to developing models in an efficient and scalable way.

Two ways that will help organize your inputs, outputs and flow of data are **data normalization** and **lists.**

Data normalization

- This is the process of structuring a database by creating tables and establishing relationships between those tables
- This can be completed in R, Excel CSVs, SAS or SQL
- This is an efficient way to store data and relationships, as all information is only added once



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4

4

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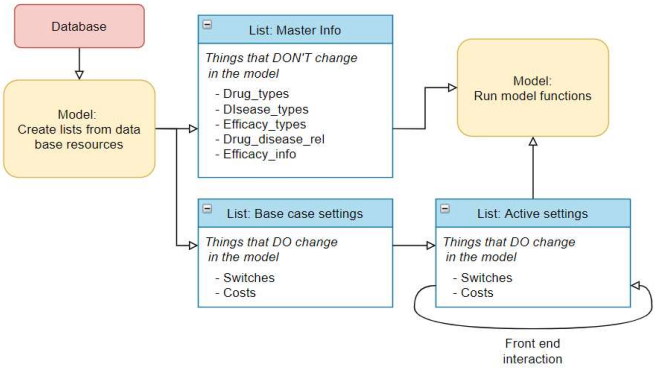
Lists

- An R list is an object that contains elements of different types (character strings, vectors, matrices, data frames, other lists)
- R lists can therefore be used to contain an index of all the information needed in the model
- It is recommended to have one static list for inputs that do not change (e.g. disease and drug names) and one dynamic list for inputs that may change (e.g. costs and settings)



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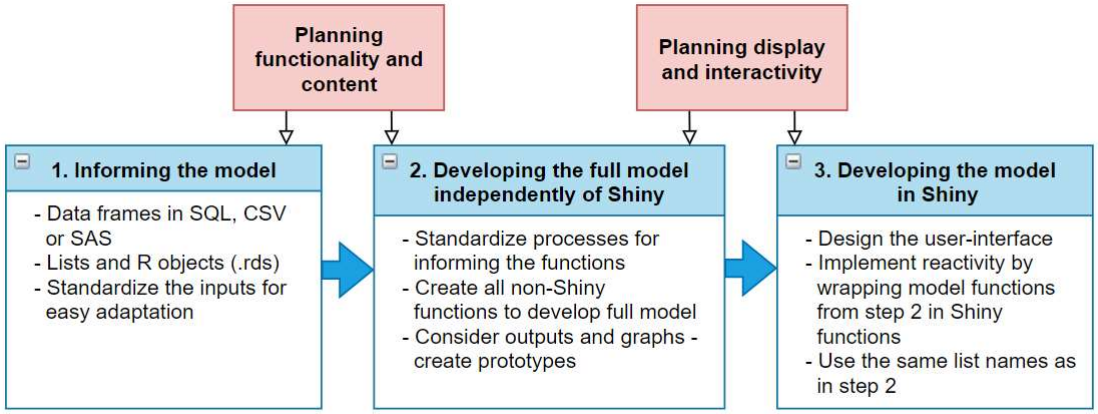
5

5

Organizing and developing R and R Shiny models

Model development example workflow diagram:



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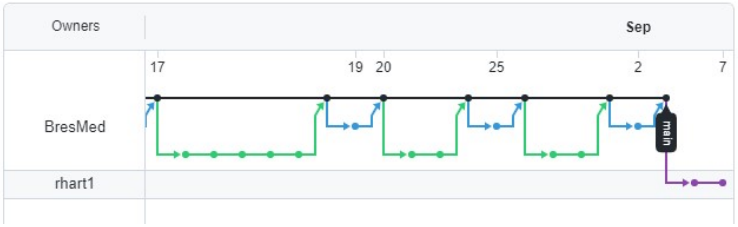
6

6

How to work within a team

- Version control software is essential (Git is commonly used for this) and can then be viewed and managed by collaboration platforms (GitHub, Gitlab, Bitbucket)
- Version control allows developers to make changes to their own version of code
- They submit requests to merge their updates with the main project version
- A reviewer may review their code and make amendments or comments to send to the developer, before selecting whether to merge changes
- All line-by-line changes are recorded, and each code 'commit' has a comment associated with it. This way, developers can pass code versions back and forth and monitor progress



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7

7

How to share and deploy models

- To widely distribute applications, they are typically hosted online
- To host an app online, the app needs to be saved to a location on a server
- There are a few ways of doing this. Choosing the right solution depends on security requirements, IT capabilities and budget
- Once the system is set up, applications can be deployed by developers at the click of a button

	Shinyapps.io	RStudio Connect	Shinyproxy via Docker
Security	Hosted on RStudio servers – log-in options available	Installed on selected server – two-factor authentication available	Installed on selected server – two-factor authentication available
Annual price*	Low – subscription to Shinyapps.io	High – subscription to RStudio Connect and virtual machine	Medium - subscription to virtual machine
Set-up	Easy	Medium – IT admin required	Advanced – IT specialist required
Maintenance	Easy	Medium – IT admin required	Medium – IT admin required

*Price depends on number of users, number of applications, number of hours used and machine specifications.

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8

8

Poll: What most inhibits you from using R Shiny more?

- Learning curve in developing R skills
- No demand from clients
- Lack of acceptance from HTA agencies
- Uncertainty about the model development process
- Nothing - I use R/R Shiny as much as I need to

Key: HTA, health technology assessment.

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9

9

Thank you

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10