Our people.
Your success.

The Potential of R Shiny User Interfaces to Support Health Economic Decision Making.

Rose Hart
BresMed, Sheffield, UK

Using R: A consultancy perspective in model development

Generally, there is a clear preference for Excel in our client projects:

- Ubiquitous availability of Excel
- Learning curve associated with alternatives
- HTA preference for Excel
- *Perceived* transparency advantage

However, there are significant advantages to using R that would benefit our projects, including:

- The statistical analysis and cost-effectiveness analysis can be in one place
- Code can be much more efficient and transparent to write, review and adapt over time – especially in large projects
- Model can be deployed online. It can then be accessed and used anywhere with an internet connection

R is often inaccessible to non-R users. The *Shiny* package overcomes this, allowing users to interact directly with R functionality without having to view or edit the code.

R and *Shiny* for cost-effectiveness analyses: why and when? A hypothetical case study

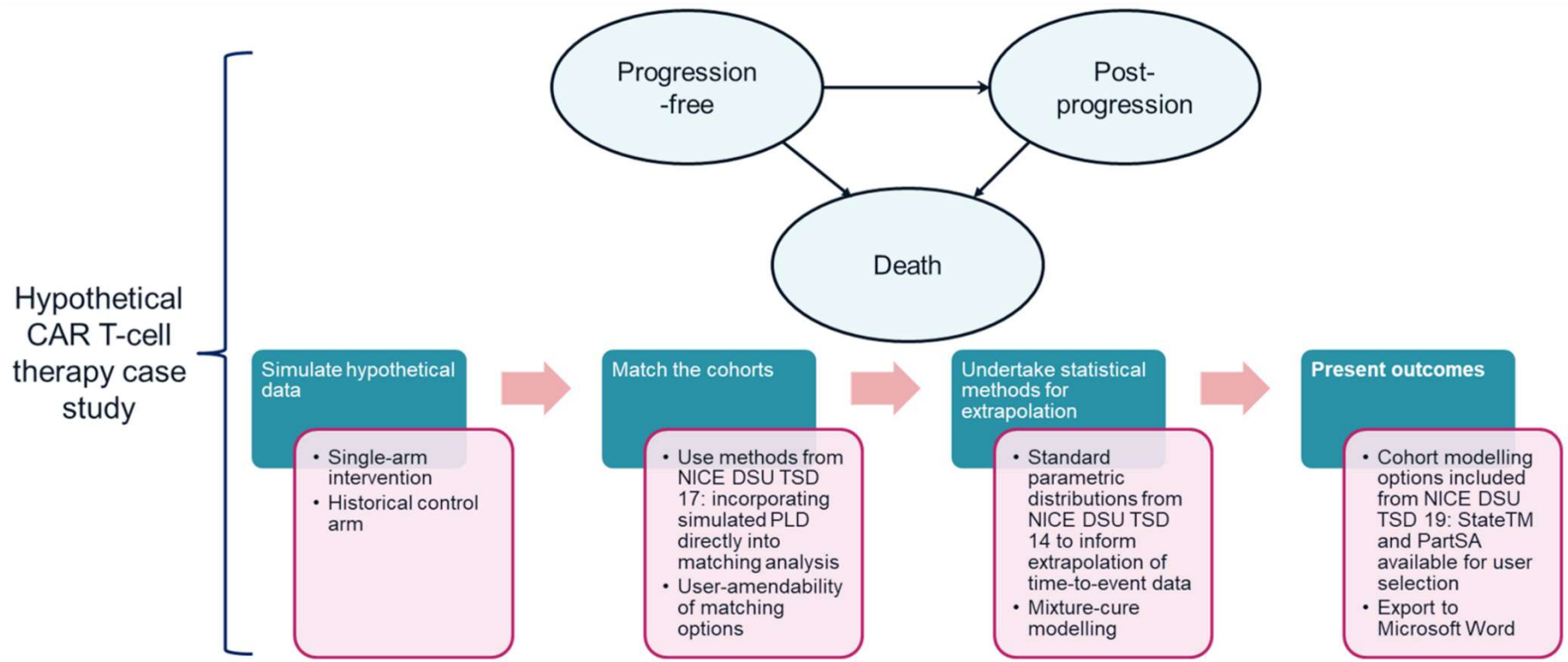
To demonstrate the potential of R *Shiny* in an HEOR / HTA setting, we wanted to create a model that includes many of the advantages of R *Shiny* applications, primarily:

- End-to-end modelling, from patient data to cost-effectiveness outcomes
- Complex statistical analyses
- User-friendly interactive front-end, with informative visuals

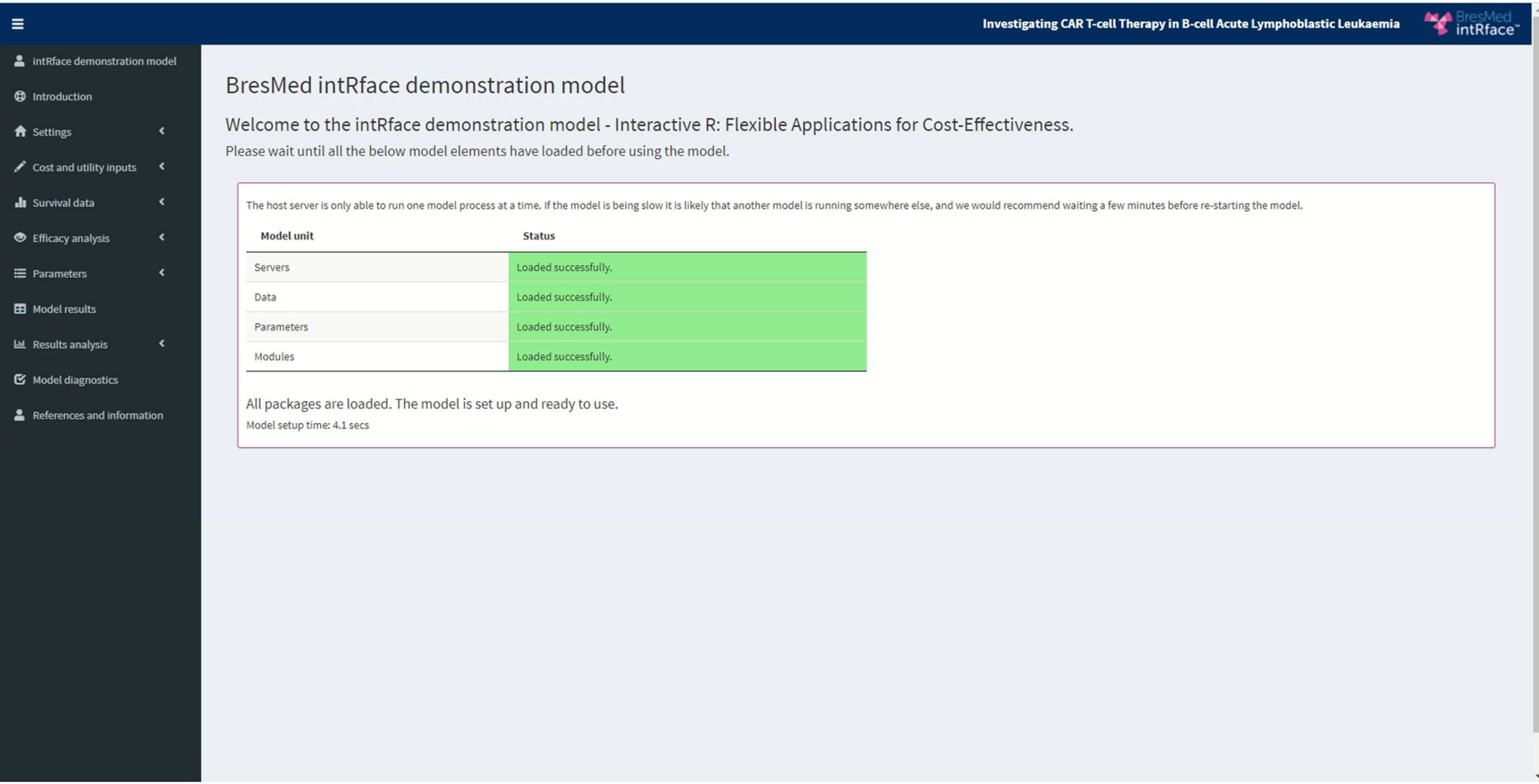
We used this case study was used to produce an explicit comparison between Excel and R with *Shiny* interface in cost-effectiveness analysis.

- An R *Shiny* model was developed, and an Excel model was produced alongside as validation and comparison

R and *Shiny* for cost-effectiveness analyses: why and when? A hypothetical case study



Key: CAR, chimeric antigen receptor; NICE DSU TSD, National Institute for Health and Care Excellence Decision Support Unit Technical Support Document; PartSA, partitioned survival model; PLD, patient-level data; StateTM, state transition model.


Investigating CAR T-cell Therapy in B-cell Acute Lymphoblastic Leukaemia
BresMed intRface
intRface demonstration model
Introduction
Settings
Cost and utility inputs
Survival data
Efficacy analysis
Parameters
Model results
Results analysis
Model diagnostics
References and information
BresMed intRface demonstration model
Welcome to the intRface demonstration model - Interactive R: Flexible Applications for Cost-Effectiveness.
Please wait until all the below model elements have loaded before using the model.
The host server is only able to run one model process at a time. If the model is being slow it is likely that another model is running somewhere else, and we would recommend waiting a few minutes before re-starting the model.
Model unit
Status
Servers
Loaded successfully.
Data
Loaded successfully.
Parameters
Loaded successfully.
Modules
Loaded successfully.
All packages are loaded. The model is set up and ready to use.
Model setup time: 4.1 secs

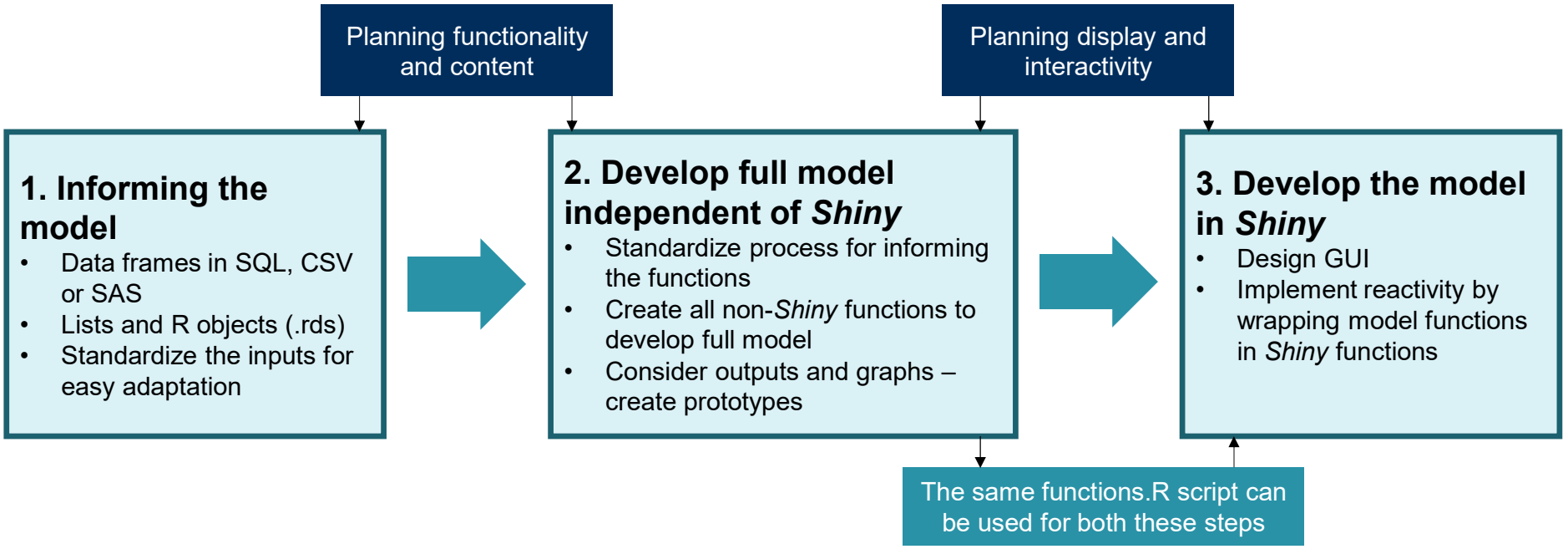
Summary of explicit comparison between R *Shiny* and Excel

1. Improvement in analytical capabilities for R *Shiny* model
2. Potential for equivalent data safety
3. Model building for R may take longer initially, but will save time in the long run if changes, adaptations and associated report updates are anticipated
   - The first time writing a new functionality is always going to take the longest
4. Models written in both can be easy to navigate and usable for technical and non-technical users
5. Transparency advantages for the R *Shiny* model
6. The R *Shiny* model is far more adaptable
   - E.g. End-to-end modelling, outputs to Word and PDF, code is very scalable
   - Multiple base cases can be saved and loaded (e.g. Via a SQL data server)
   - If edits are made, then they only need to be uploaded to a single model version
7. The R *Shiny* model requires an internet connection to use

Model development workflow

Separate the three parts of the app. Develop, review and document each one individually.

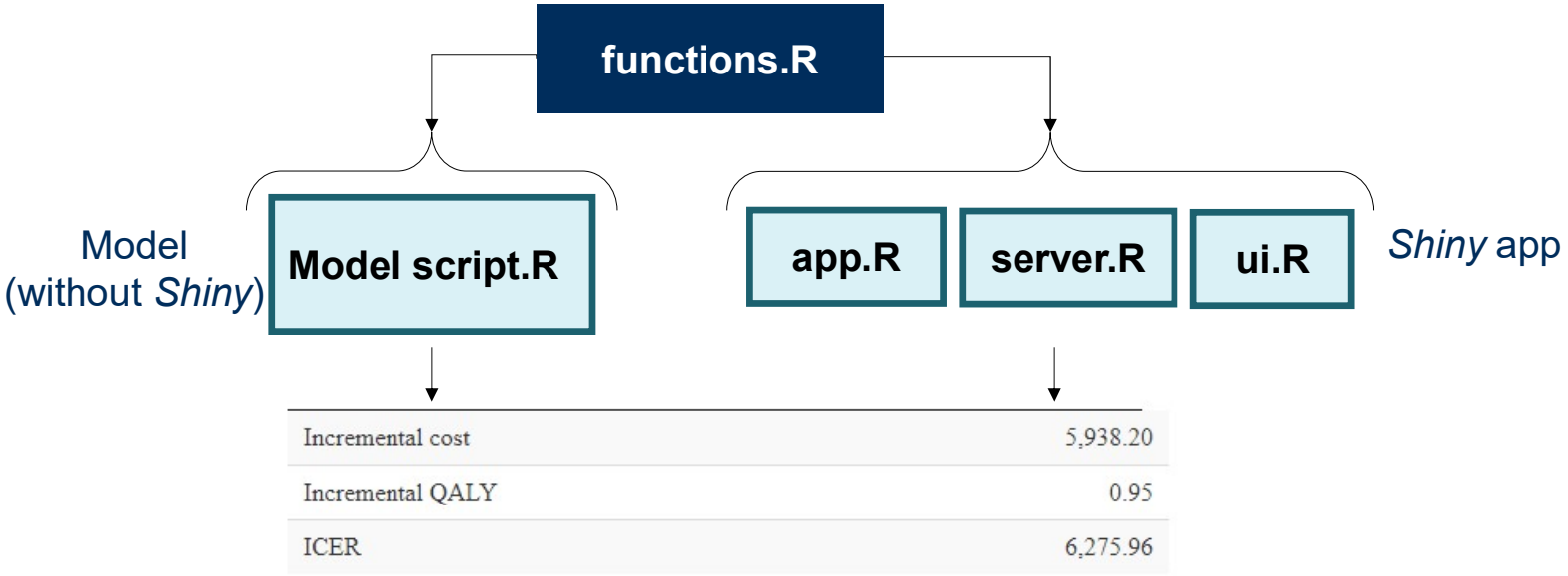
This approach complements parallel working within a team and training up individuals.



Model development workflow – Briggs et al. HIV model

A simple example of this workflow can be found in the R in HTA GitHub repository: The Briggs et al. HIV model (Chapter 2) has been programmed in R, then converted to R with *Shiny*.

- The layout of the functionality (server.R in the *Shiny* app) is the same between both models
- The functions.R script is used by both models



R *Shiny* in HEOR consultancy

There are several challenges to overcome if R, with or without *Shiny,* is to be consistently used in HTA submissions:

- Not all HTA agencies accept R for submissions
- Not all ERGs like reviewing R code

At present, there are many areas where R *Shiny* is useful for model development within consultancy, especially:

- Early modelling tools
- Feasibility assessments
- Value and communication tools

Shiny lends itself to modelling in HEOR by being accessible, widely distributable and adaptable for both the user and the developer.

Key: ERG, Evidence Review Group

References and materials

- Hart, R., Burns, D., Ramaekers, B. et al. R and Shiny for Cost-Effectiveness Analyses: Why and When? A Hypothetical Case Study. PharmacoEconomics 38, 765–776 (2020). https://doi.org/10.1007/s40273-020-00903-9
- App can be found at: https://bresmed-intrface-hypothetical-car-t-model.shinyapps.io/IntRface_Model-PharmacoEconomics/
- Shiny Briggs et al. HIV model: https://github.com/rhart1/Shiny-Briggs-HIV-model---R-in-HTA-showcase-2021/

Thank you for listening

BresMed™