Health technology assessors' perspectives on R

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REVIEW OF SOFTWARE FOR DECISION MODELLING.

DECISION SUPPORT UNIT

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- July 2008
- Survey of
  - ERGs (6),
  - Manufacturers (14) and
  - Consultancy Firms (8)

Software	Respondents that used this software		Number of TAGs	Number of Manufacturers	Number of Consultancies
	n	%			
MS Excel	28	100%	6	14	8
TreeAge Pro	16	57%	6	7	3
WinBUGS	6	21%	1	2	3
R	5	18%	1	2	2
Arena	3	11%	0	2	1
SAS	3	11%	0	1	2
Crystal Ball	2	7%	1	0	1
Simu8	2	7%	1	0	1
STATA	1	4%	1	0	0
RevMAN	1	4%	1	0	0
Borland Delphi	1	4%	1	0	0
S-PLUS	1	4%	1	0	0
@risk	1	4%	0	0	1
STELLA	0	0%	0	0	0
Witness	0	0%	0	0	0

Reasons for feeling submitting in a package other than MS Excel or TreeAge Pro would be more appropriate

Reason	Frequency
Familiarity of the software	0 (0%)
Suitability to the type of model	7 (37%)
Computational requirements of the model	9 (47%)
Other	3 (16%) (2 = All of the above, 1 = "combine data analysis with modelling capacity"
Total	**19 (100%)**

Key reason for software choice

Reason	Frequency	Details
Familiarity of the software	6 (21%)	
Suitability to the type of model	12 (41%)	
Computational requirements of the model	5 (17%)	
Other	6 (21%)	2 = "transparency of model" 1 = "acceptability to NICE" 1 = "all of the above except familiarity" 1 = "consistency for users/reviewers" 1 = "there is no choice!"
Total	**29 (100%)**	

Ability of Assessment Groups to review models in different software packages

Software	Number of AGs			
	That have expertise	That would require minimal training	That would require substantial training	That could not review
MS Excel	6	0	0	0
TreeAge	6	0	0	0
Simul8	3	1	1	1
Arena	0	4	0	2
R	2	2	1	1
WinBUGS	2	2	0	2
Crystal Ball	1	3	2	0
Witness	2	2	0	2
S-PLUS	1	3	0	2
SAS	2	1	2	1
STELLA	1	2	1	2

- "NICE should stimulate the use of R. Official recognition and governmental acceptance will help its further development. Further, allowing people to step outside the restriction of pre-programmed packages will force them think again about what they are doing."

Consultancy Organisation

- "It would be helpful if NICE could expand the list of approved software to include R and other commonly used modelling software"

Healthcare industry

A Comparison of Four Software Programs for Implementing Decision Analytic Cost-Effectiveness Models

Chase Hollman[1] · Mike Paulden[1,2] · Petros Pechlivanoglou[3,4,5] · Christopher McCabe

Key Points for Decision Makers

Microsoft Excel and TreeAge Pro are good programs for implementing the types of cost-effectiveness analyses commonly required by health technology assessment bodies.

MATLAB and R are particularly valuable for implementing more complex decision analytic models and computationally demanding analyses, such as expected value of perfect parameter information (EVPPI), due to their processing speed and transparency.

2018 Survey of Evidence Review Groups

- NICE ERGs
  - BMJ Technology Assessment Group (BMJ-TAG), BMJ, London
  - CRD and CHE, University of York
  - HRU and Health Services Research Unit, University of Aberdeen
  - Kleijnen Systematic Reviews Ltd, York
  - Liverpool Reviews and Implementation Group, University of Liverpool
  - Peninsula Technology Assessment Group (PenTAG), University of Exeter
  - School of Health and Related Research (ScHARR), University of Sheffield
  - Southampton Health Technology Assessment Centre (SHTAC)
  - Warwick Evidence, Warwick Medical School, University of Warwick
- All Wales Therapeutics and Toxicology Centre (AWTTC)
- Scottish Medicines Consortium Secretariat

Responses

- NICE (n=8)
- AWMSG (n=9), SMC (n=2)

Percentage of modellers in ERG:

ERG	Who have expertise in R	Who would require minimal training in R	Who would require substantial training in R	Who cannot review decision models in R
1	0	0	10	90
2	22	11	11	56
3	25	20	80	75
4	33	20	13	67
5	50	20	20	10
6	75	0	25	0

- Ability to review a model's structure, equations, parameter values, and assumptions in R
  - AWMSG / SMC:
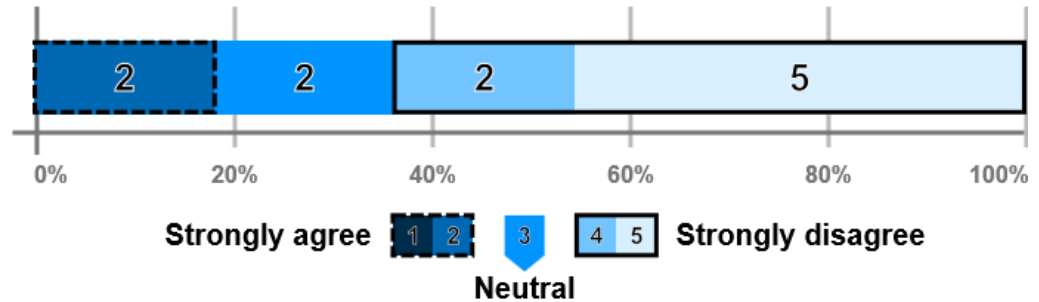
  - NICE ERG:
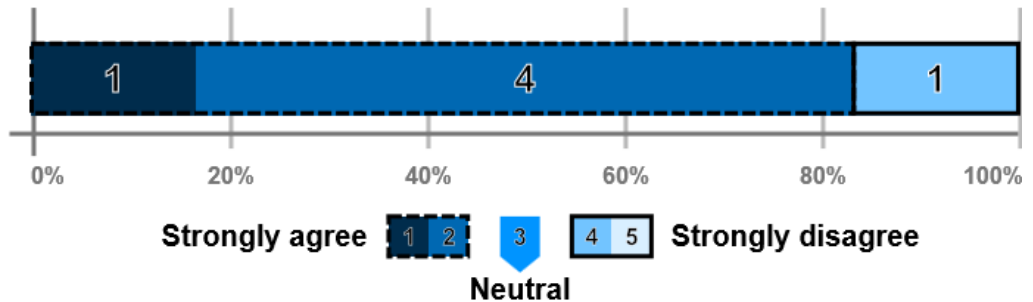
- Addresses whether the model's parts behave as intended and the model has been implemented correctly
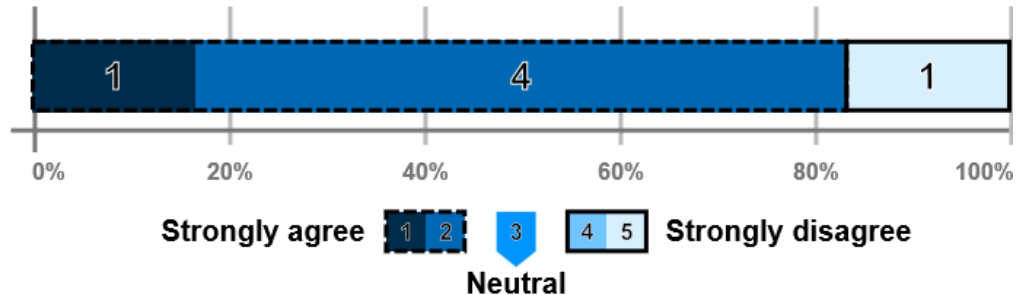 - AWMSG / SMC:
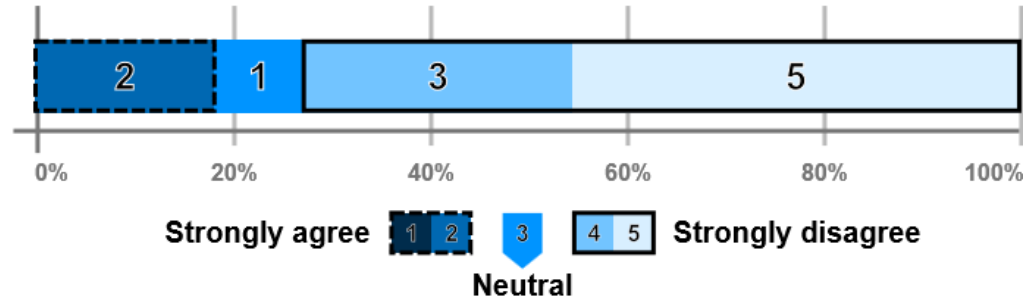
  - NICE ERG:
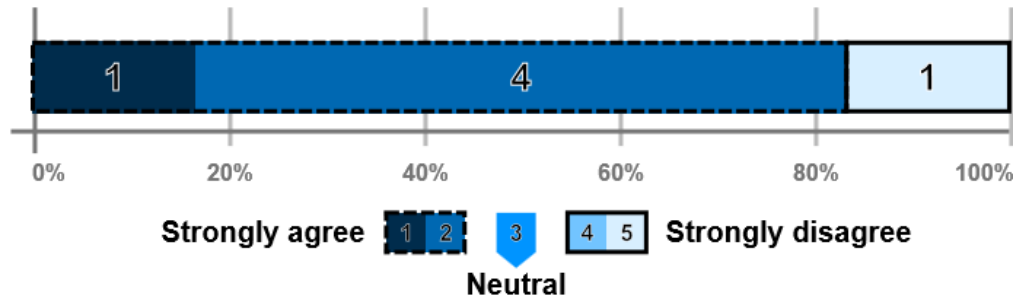
- Generate new scenarios or edit data parameters and re-run the model in R
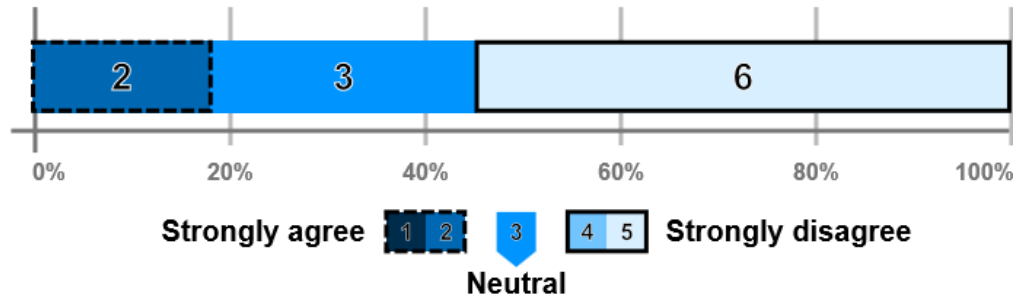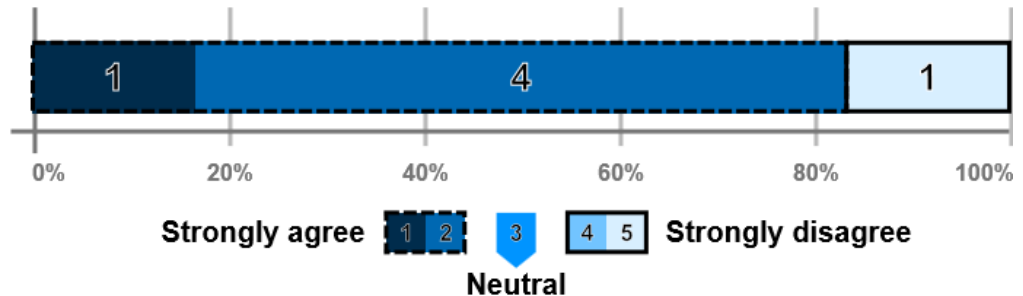 - AWMSG / SMC:
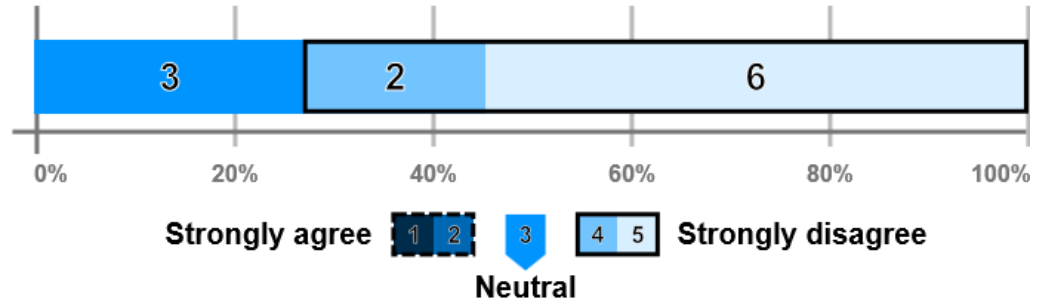
  - NICE ERG:

Capable of evaluating decision models in R

- AWMSG / SMC:

- NICE ERG:

Strengths & weaknesses

	Strengths of R	Weaknesses
• **Efficiency**	• Computational efficiency, conciseness of code compared to Excel numerous rows in worksheet • Flexibility, the running speeds (typically) and the pre-built packages • Outputs can be generated quickly in R • Once the codes have been written, an entire analysis can be re-run quickly	
• **Functionality**	• Ideally there is an overall analysis that seamlessly includes evidence synthesis and economic modelling • Components in R i.e. meta-analysis, modelling and PSA can be run simultaneously • R is much more visually appealing than Excel • Large datasets are easier to manage in R compared to Excel	• Poorer user-interface and potential for an error to be hidden deep within functions (although the same can be said for VBA) • I believe that bugs in Excel are easier to spot than bugs in R
• **Cost**	• Free availability	

Strengths of R	Weaknesses
• **Understanding / accessibility**	• R is not widely understood • R is not as accessible as Excel to the people we work with (NICE staff and committee members) • R requires training in coding
• **Transparency**	• Excel is more transparent. • Models submitted in R can lack transparency • If a model makes use of a package, within R, which is outside of the knowledge of the reviewer there may be difficulty in identifying the processes undertaken • The relationships between variables, commands and outputs are not always clear. In Excel models, one is able to 'see' the numbers, follow the logic and calculations. This clarity allows a good understanding of the underlying mechanics of what's happening in the model, especially inconsistencies • R does not provide the continuous check that Excel offers

"I remain to be convinced that the strengths of R outweigh the disadvantages…

…I would love to attend the workshop…

…but can't "

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