RAT-RS Pack User Guide v1.0 (Full Version)

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RAT-RS Developers

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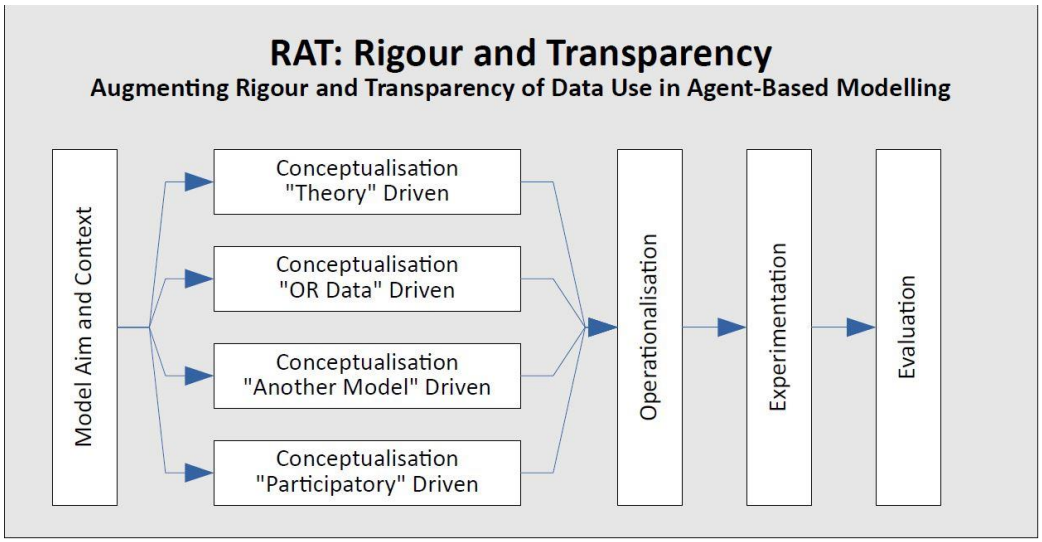
Summary

The Rigor and Transparency Reporting Standard (RAT-RS) is a tool to improve the documentation of data use in Agent-Based Modelling. Following the development of reporting standards for models them selves, attention to empirical models has now reached a stage where these standards need to take equally effective account of data use (which until now has tended to be an afterthought to model description). It is particularly important that a standard sho uld allow the reporting of the different uses to which data may be put (specification, calibration and validation), but also that it should be compatible with the integration of different kinds of data (for example statistical, qualitative, ethnographic and experimental) sometimes known as mixed methods research. For the full details on the RAT-RS, please refer to the related publication "RAT-RS: A Reporting Standard for Improving the Documentation of Data Use in Agent-Based Modelling" (Achter et al. 2022).

The following figure shows the RAT-RS question suites, where the box names indicate the focus of a specific question suite. The RAT-RS comes in "flavours" with distinct Conceptualisation question suites (horizontal boxes). So, the first step when aiming to use the RAT-RS is to identify the MAIN driver for the initial model development step. Possible choices currently supported by the RAT-RS are "theory-driven" models, which focus on a pre-existing theory or theories, "OR-data-driven" models, which focus on key mechanisms, "another-model-driven" models, which focus on a pre-existing model or models, and "participatory-driven" models, which focus on the use of participatory processes to design models.



There are two different sets of RAT-RS supporting material: one for people who prefer Word and one for people who prefer Excel. Following are the details on how to use each:

- **RAT-RS Word-Version, located in the "Word-Version" folder:** The "Templates" folder contains question documents for each of the different flavours. Choose the one that is appropriate for your purpose (e.g. "Another Model Driven RAT-RS Template v1.0.docx" if you are reporting on an "another-model-driven" modelling project). You can then use either the chosen question document or the "RAT-RS Answer Template

v1.0.docx" document to capture your answers. Questions can be answered by using free text only, or with the support of the provided table templates ("RAT-RS Answer Table Templates v1.0.xlsx"). Two examples of filled RAT-RS documents are available in the "Examples" subfolder. One of these, named "Example - Another Model Driven RAT-RS v1.0 Chattoe-Brown (2014).docx", uses free text. The other, named "Example - OR Data Driven RAT-RS v1.0 Siebers & Aickelin (2011).docx", uses free text and the provided table templates.

- **RAT-RS Excel-Version, located in the "Excel-Version" folder**: The {RAT-RS Template} sheet of the "RAT-RS Excel-Version Templates v1.0" workbook contains the components to assemble a RAT-RS question sheet. One has to copy the questions related to the chosen flavour from column J (e.g. rows 3-12 for the theory-driven flavour) into column C (rows 12 to 21). Questions can then be answered by using free text in column E for all questions, or by using free text in column E for some questions and the table templates {RAT-RS Template T1} and { RAT-RS Template T2} sheets for questions 2.3-2.7 and 3.1-3.13. Examples for both cases are provided in the "RAT-RS Excel-Version Examples v1.0.xlsx" workbook. The {RAT-RS Example 1} sheet provides an "another-model-driven" RAT-RS usecase, while the three {RAT-RS Example 2} related sheets provide an "OR-data-driven" RAT-RS usecase.

Note that not all questions have to be answered. However, you are encouraged to provide as much information as possible. Remember that this is a documentation tool. It is for capturing data use and its reasons in a non-judgemental way. If a question is unclear to you, please answer it following your instinct, and leave a remark in the "Any additional comments?" space of the related section. If you want to capture information about changes you made to the use of data over time (i.e. if you changed your mind while modelling), you can also provide this information together with some justification in the "Any additional comments?" space of the related section.

Since the used terminology in scientific modelling does not follow an overarching standard and is often contingent on communities and disciplines, we provide a contextualisation of key terms that are used in the RAT-RS. You can find our current "Glossary of Terms" at the end of this user guide.

A final note. If you want to help us to develop this RAT-RS further, please email us a copy of your filled in RAT-RS document(s) and share your experience with filling it in. We also welcome suggestions for future improvements. Emails can be sent to peer-olaf.siebers@nottingham.ac.uk.

Reference

- Achter S, Borit M, Chattoe-Brown E, and Siebers PO (2022) " RAT-RS: A Reporting Standard for Improving the Documentation of Data Use in Agent-Based Modelling", International Journal of Social Research Methodology, http://dx.doi.org/10.1080/13645579.2022.2049511.

Glossary of Terms

Term	Definition	Evidence
Data	Data can be described as entities discernible from their context, defined by the specifics of measurement (Boisot & Canals 2004; Floridi 2016). Such data become information only if they have meaning according to the widely recognised "General Definition of Information" (Floridi 2016).	Boisot, M. & Canals, A. (2004). "Data, information and knowledge: have we got it right?" Journal of Evolutionary Economics, 14(1), 43-67. Floridi, L. (2016). "Semantic Conceptions of Information". In: The Stanford Encyclopedia of Philosophy (Winter 2016 Edition). https://plato.stanford.edu/archives/win2016/entries/information-semantic/>.
Data element	A data element is data corresponding to a model element. So, for the disease example, the data element for contact might be a survey (or diary) of social contacts while for disease progression it might be medical histories/records (and perhaps even laboratory data on how the disease "works").	Our own definition.
Domain	A distinct area of research interest independent of disciplines or applied methods.	Our own definition.
Driver	Main starting point for the development of the agent-based model	Our own definition.
Empirical evidence	Scientific evidence produced by empirical research methods.	Our own definition.
Model	An abstract representation of reality (e.g. a phenomenon, elements of the real world, or a real world system of interacting elements)	Partly from the ResearchGate answer to the question, "A model is usually believed to be an abstract representation of reality. How abstract should a specification be to be considered a model?". Examples are our own.
Model element	A model element is part of a model that may be somewhat self-contained and/or distinct in its operation. For example, in a disease model you need both a model element for the contact process (who meets who and where) and another for the disease progression process (what happens once you are infected). One refers to an individual and their physiology and is thus somewhat distinct from the other, which refers to interactions in the social world.	Our own definition.
Phenomenon	Phenomena are states or behaviours of a real-world system or group of systems, studied by a particular discipline, such as population growth, competition, or predation.	Elliott-Graves, A. (2020). "What is a target system?" Journal of Biology & Philosophy, 35(2), 1-22 (p28).

Qualitative vs quantitative data	Qualitative data is defined as non-numerical data, such as text, video, photographs or audio recordings. Therefore, quantitative data are defined as numerical, such as closed survey responses or sensor data.	https://www.simplypsychology.org/qualitative-quantitative.html with our own additions.
Scientific evidence	The available body of facts or information indicating whether a belief or proposition is true or valid.	https://www.lexico.com/definition/evidence
Target system	A target system is those aspects of the real-world system that are studied in order to gain knowledge about the phenomenon.	Elliott-Graves, A. (2020). "What is a target system?" Journal of Biology & Philosophy 35(2) 1-22 (p28).
Theory	Collective term for theory, theories, or theoretical constructs; generally something theoretical and not only what is understood as a "mature" theory	Our own definition.
Theoretical vs empirical	Theoretical means originating from abstract theory while empirical means originating from empirical data.	Our own definition.