Engaging users in critical appraisal of computer model software

C. Rosello [a] [ID], J.H.A. Guillaume [a] [ID], P. Taylor [b] [ID], S.M. Cuddy [c] [ID], C.A. Pollino [c] [ID]
and A.J. Jakeman [a]

[a] *Institute for Water Futures, Fenner School of Environment and Society, The Australian National University, Canberra, Australia;* [b] *CSIRO Data61, Sandy Bay, Australia;* [c] *CSIRO Environment, Canberra, Australia*
Email: caroline.rosello@anu.edu.au

Abstract: User-centric approaches are advocated to improve the development and uptake of model software to inform adaptive planning decisions. However, guidance on including current and future requirements of users in development processes is still needed. An important consideration when including users in model software development is defining a 'user'. It varies according to different user-centric approaches and influences users' participation types and levels of involvement – with implications for shared understanding and coordination of tasks in collaborative development processes. Another consideration relates to developers' perception of the feedback value of users – ultimately affecting their perception of users as credible sources to inform development decisions. Less explored in model software development, innovation-based markets (i.e. commercial arena that could be driven by or driving user demands for innovation) can influence developers' need to understand users' requirements and, consequently, users' inclusion in model software development. For example, to create future demands for a tool (innovation driving user demands), developers need to understand and anticipate prospective users' requirements for adopting their tool. Conversely, understanding users' requirements may not be necessary if considering existing users (innovation driven by user demands). These considerations call for reflective approaches to contextual, development and interpersonal factors influencing the inclusion of users in development processes. Critical appraisal approaches proffer help in achieving such an inclusion outcome. These approaches have been reported to support shared learning and understanding through clarifying knowledge and judgements and contribute to coordination of tasks through negotiation and building a shared agreement. Furthermore, as inclusive of different perspectives, they could help anticipate future challenges and opportunities to model software uptake and inform adjustments in development processes so as to deliver into innovation-based markets.

We propose a critical appraisal approach (CAA) to guide model software evaluation, consisting of a questionnaire and directions of use. We use the Basin Futures model software (https://basinpedia.basinfutures.com) as a case study to develop the approach and review the literature to identify factors influencing model software development and uptake. Compared to traditional approaches to model software evaluation, the novelties of the CAA are to consider (1) explicitly a critical appraisal approach for our questionnaire design and (2) different dimensions of processes and their alignments, from thinking to model software development and coordination of tasks to contextual factors contributing to model software development and uptake. This paper presents how the CAA was designed and identifies different factors influencing learning, knowledge sharing, and reporting. Results show the importance of (1) aligning development with market processes and (2) creating a shared understanding between users and developers for improving user inclusion in development processes. Different features of the CAA suggest potential applications beyond user inclusion, such as for bridging disciplinary silos in model software development or, for developers, to be used as a monitoring tool for value creation in competitive markets.

Future research will investigate CAA's practical contributions to users' inclusion and the extent to which it can effectively contribute to knowledge creation, better inclusion of users in model software development processes, and adaptation to market changes. It will also investigate the transferability of the approach to other model software informing planning and management decisions, application with different users (novice and expert users) and explore its possible uses beyond model software evaluation.

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