The synthesiser role of expert modellers in multidisciplinary research projects: a practical guideline

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Traditional system dynamics modelling frameworks do not offer enough practical insight on how best to deal with stakeholders, especially in multidisciplinary research projects. Expert modellers with advanced technical capabilities often face difficulties dealing with complex social environments. Additionally, inadequate modeller stakeholder management is harming the reputation of system dynamics as a modelling tool in research projects. This paper provides initial recommendations regarding adaptation of process consultation theory to expert modelling in a multidisciplinary research project. The guidelines provide a phased approach regarding stakeholder management and should be considered supplementary to traditional system dynamics frameworks.

The type of project described in this paper has four distinct attributes. Firstly, the modeller is part of a multidisciplinary team. Secondly, multiple disciplines of research are conducted, most of which are used as input for a system dynamics model (inputs could be structural or numerical). Thirdly, the project employs a traditional system dynamics development framework (Randers, 1980; Richardson & Pugh III, 1981; Roberts, et al., 1983; Wolstenholme, 1990; Sterman, 2000; Moxnes, 2009) instead of a group model building methodology (Vennix, et al., 1992; Andersen, et al., 1997; Vennix, 1999; Luna-Reyes, et al., 2006; Hovmand, et al., 2012). Finally, researchers aim to answer a specific research call through detailed project reports, articles and or other type of knowledge dissemination.

Methodology

We conducted a qualitative comparison of the process of expert modelling in academia, private consulting as well as public administration. Eleven multidisciplinary research projects with system dynamics as synthesiser, conducted between the years 2015 and 2018, were compared. The projects were from a broad range of industries including five in life sciences, four in resource use and two in social science - with a diverse range of topics including agriculture production, agri-business, material and energy flows, intrinsic motivation as well as state failure. All projects followed some variation of a traditional system dynamics framework (Randers, 1980; Richardson & Pugh III, 1981; Roberts, et al., 1983; Wolstenholme, 1990; Sterman, 2000; Moxnes, 2009). The authors were not necessarily the expert modellers in all projects used for comparison: sometimes they embodied the role of project manager, domain expert or client as described by Onggo, et al. (2014) – thus this reflection provides insights from all four roles. Limitations of the data in this study include the limited sample size, the fact that the sample is not representative of the population in terms of research topic or even domain and finally the qualitative methodology employed. Nevertheless, we concluded that the data is diverse enough to draw some initial conclusions and better understand the role of “synthesiser” played by expert modellers in multidisciplinary research projects.

Literature

There is a clear process and outcome distinction between expert and facilitative modelling. Since existing facilitative modelling literature (Snabe & Größler, 2006; Größler, 2007) focusses on Schein's (1999; 1969) work in process consultation theory, this paper is aligned with the same author. Schein (1999, 1969) distinguishes between three different organisational intervention models namely the Purchase of Expertise Model, the Doctor-Patient Model and the Process Consultation Model. The Purchase of Expertise Model describes the case where the client seeks an independent perspective on how to approach a specific problem. Instead of focussing on any kind of interpersonal interactions with the client, dispassionate expertise is provided (Appelbaum & Steed, 2005). Alternatively, the Doctor-Patient Model describes the case where a consultant is invited to apply a diagnostic approach to examine a client's problems. An external party is effectively tasked to investigate, interview, psychologically asses, test, diagnose and recommend a cure (Schein, 1990). Finally, the Process Consultation Model puts the consultant in the role of a facilitator tasked with empowering the client to diagnose and solve their own problems using their own abilities and expertise (Appelbaum & Steed, 2005).

Recommendations

Different tasks within the project require different models of conduct. This paper identifies the most crucial situations the expert modeller should act in each of Schein's (1999, 1969) three organisational intervention models.

1.1 Purchase of Expertise Model

When an expert modeller first gets involved with the project, either during the project proposal or commencement phase, they should take the initiative and explain the system dynamics methodology including its capabilities and limitations to the entire research consortium. This process should be conducted in the Purchase of Expertise Model as a system dynamics expert. This is important to ensure mutual understanding between the modeller and all stakeholders; especially for project managers responsible for all project deliverables.

After some basic understanding of system dynamics is established, the modeller should remain in the Purchase of Expertise Model for the duration of the commencement phase of the project. This includes being well prepared for any contact events. The primary objective during project commencement should be to establish a feasible model scope and boundary. Scope and boundary discussions should include the basic nature of inputs required from research partners and their submission deadlines within the overall project timeline. Given the essential nature of the scope and boundary condition, we identify this action as the only time it is justifiable to exploit the imbalance of power from having scarce modelling expertise (Clegg & Hardy, 1996). Finally, note that a crucial part of reaffirming and maintaining the model scope and boundary is to manage the expectations of both consortium partners and external stakeholders.

1.2 Process Consultation Model

Opposed to the discipline of facilitative modelling (Rouwette & Vennix, 2006; Snabe & Größler, 2006; Größler, 2007), and as the title *expert modeller* implies, the modeller shouldn't spend too much of their time in the Process Consultation Model since stakeholder buy-in is not the most crucial success factor within the project. After the model scope and boundary are finalised in the Purchase of Expertise Model, the aggregate dynamic hypothesis should be defined in the Process Consultation Model. In most projects, this translates to facilitating the development of the most aggregate causal structure overlaying all research disciplines by the stakeholders. Not only does this give the expert modeller a very good overview of the project in its entirety, it also leads to at least partial stakeholder buy-in since there is transparency in the synthesis. Later in the project, if the political climate allows, the expert modeller could give research partners a degree of co-design ability when deciding of the aggregation of their part of the model while acting in the Process Consultation Model.

1.3 Doctor-Patient Model

After the development of the aggregate dynamic hypothesis, we recommend that the default mode of the expert modeller be the Doctor-Patient Model since the primary task of an expert modeller is to produce a system dynamics model promoting project synthesis. Even though good interpersonal relationships with stakeholders are not a strict requirement in the Doctor-Patient Model, this paper recommends that the modeller tries their best to communicate with stakeholders in a friendly and helpful manner from the position of an expert prescribing the best course of treatment.

Another activity the expert modeller should undertake in the Doctor-Patient Model, even though research partners would likely resist the Doctor-Patient Model in this context, is controlling the level of aggregation during conceptual and executive synthesis conversations. Research partners feel most comfortable maintaining the conversation in their domain of expertise where they can discuss minute details of very complex topics. The expert modeller should ensure research partners that they are aware of greater complexities but act autonomously in judging which level of aggregation is the minimum requirement for synthesis in the system dynamics model. This requires some element of trust in the expertise of the modeller from research partners.

Conclusion

This study is meant as a preliminary attempt to share some knowledge regarding efficient stakeholder management in a discipline where only model results are traditionally disseminated. The authors hope that this paper will spark discussion about the development of basic scripts for expert modellers similar to those available to group model builders.

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