IMP 2025 special track call for papers

It's a SIN! Simulating Industrial Networks

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Although computer-based simulations are widely used in social sciences (e.g., psychology, economics and political sciences), and gain traction in management studies (Onggo and Foramitti, 2021), we have not yet embraced this methodology to its full potential in interorganisational analyses of industrial business networks (Prenkert, 2017:317). A simple *Web of Science* literature search illustrates this view yielding only about 20 articles. However, as proposed by Harrison et al. (2007: 1232), simulations can be particularly useful to study complex interactive systems, a category including interorganizational industrial networks.

When looking at interorganizational issues, simulations have mostly been applied to supply chains (see e.g., Giannoccaro, 2018; Fleish and Powell, 2001), as they are, by definition, a closed system, as opposed to industrial/business networks in the IMP sense, which are, by definition, open systems without natural boundaries, which poses a problem for formal modelling and simulations (Prenkert and Følgesvold, 2014). Instead, the use of computer-based simulations to study relationships and networks from an IMP perspective remains very scant, with just a handful of publications (Wilkinson and Young, 2013; Wilkinson et al., 2011) and even fewer actual simulations of specific relationships and networks, with the notable exceptions of e.g., Følgesvold and Prenkert (2009), Forkmann et al. (2012), Prenkert and Følgesvold (2014), Purchase et al. (2014), Olaru and Purchase (2015), and Kostelić and Turk (2024).

There are several simulation approaches and models applied in management studies to interorganizational issues: discrete time and events (Daaboul et al., 2014), system dynamics (Cosenz and Noto, 2016), agent-based models (D'Alessandro and Winzar, 2014), Monte Carlo (Schmitt and Singh, 2009), machine learning relying on AI algorithms (Zhang et al., 2024. Some of these approaches are supported by modelling software such as *NetLogo*, *Facts*, *Vensim*, *AnyLogic* (Zhao et al., 2020). The few actual IMP-inspired simulations of industrial networks rely on agent-based models (e.g., Følgesvold and Prenkert, 2009; Prenkert and Følgesvold, 2014; Purchase et al., 2014), an approach advocated from a an ontological viewpoint by Prenkert (2017), and from a conceptual viewpoint by Wilkinson and Young (2013) and Wilkinson et al. (2011) given its ability to systematically model the behaviour of single actors and their interactions, two key elements for the IMP approach.

Employing agent-based simulation models in IMP-inspired studies of business networks poses problems not only because of the open nature of the system, but also because of the nature of interactive decisions and behaviours (Guercini et al., 2014; Guercini et al., 2022). This interactivity is indeed an essential element in the IMP approach, well engrained also in epistemological choices such as the diffuse adoption of case studies and a process perspective. In this sense, the limited use of simulation models and the limited extent of IMP literature on the subject are not surprising. Today, however, it is important to extend the discussion about the use of computer-based simulations because there is a need for new tools for studying the dynamics of business networks. Even though simulations face problems when applied in an

IMP context, an open discussion of their limitations and potentials is useful, considering also how such tools can be used, in a descriptive logic of scenarios (Prenkert and Følgesvold, 2014) rather than prescriptively. Moreover, the spread of AI assistants and AI agents may give a different meaning to the links between simulation models and widespread models of decision-making and behaviour (with different perspectives, see: Kahneman, 2011; Gigerenzer and Todd, 2012).

There is a need to accumulate and consolidate the current state of art when it comes to the use of simulation in interorganizational business network research. Being able to define some 'standards', or key building blocks of computer-based models and simulations of business relationships and networks would systematically accumulate knowledge, save time and increase comparability of results among IMP scholars, while reducing the barriers to start using simulations as a method (see Wilkinson et al., 2011; Harrison et al., 2007: 1231). Moreover, as suggested by Håkansson and Waluszewski (2016), the adoption of alternative research methods – such as modelling and simulations – for investigating business relationships and networks could refer to the creation of 'images' able to illustrate the 'consequences' of the business exchange. We believe that computer-based simulations have a strong potential to extend the understanding of business relationships and networks, also by capitalizing on the vast repository of rich empirical accounts in hundreds of IMP-based case studies.

Based on the issues outlined above, this call for papers aims to fuel a discussion among IMP researchers on the topic of computer-based simulation models, how they can be developed and used for studying network dynamics, as well as their problems and advantages in this area of studies. Papers submitted to this special track may address, but not be limited to, the following topics:

- Which are the pros and cons of using computer-based simulations to study business relationships and networks?
- Actual simulations of business relationships and networks, at different stages of progress, including preparatory works for simulations.
- Considering the extensive use of simulation to model supply chains, how much and how are IMP-based concepts (e.g., trust, commitment, adaptations, resources, activities, actors, relationships, embeddedness, etc.) used in these simulation studies? What gains could come from using these concepts in simulating supply chains and/or business networks?
- While IMP studies are mostly concerned with describing and understanding business relationships and networks, simulations are a method that offers new forms of knowledge and insights. Specifically, what can be the specific purposes of applying simulations to industrial networks, considering for instance those proposed by Harrison et al. (2007): prediction, proof, discovery, explanation, critique, prescription or empirical guidance?
- IMP and the field of interorganizational business research deals with complex emergent dynamic phenomena in which causality can take many forms, not least in the shape of causal social mechanisms (Mason, Easton and Lenney, 2013). Can simulation approaches help developing knowledge and understanding on different types of causal relations in business networks?

- Considering the various simulation approaches and (software) tools available, which approaches/tools would be more useful and fit to simulate business relationships and networks from an IMP viewpoint? Which would be the pros and cons of these approaches and tools in this sense?
- If we operate in highly interdependent contexts the effect on uncertainty is ambivalent (collaborative games can occur), what is the role of features that can be given to the simulation model, e.g., transparency for the actors who can make use of it?
- How can standardized procedures, structures, and key building blocks to model and simulate business relationships and networks be developed to save time and increase comparability for researchers interested in this methodology?
- What specific role can the IMP's existing conceptual models (ARA, RIA and the original *Interaction Approach IA*) and its considerable empirical base of qualitative case studies have in modelling networks, especially for building the building blocks described above?
- What is the role of AI in the modelling of business networks, and as components included in simulation tools?
- How can simulation of business networks be combined with AI tools and what are the consequences for our ability to model business networks?
- How can simulations be used as a data generator in relation to machine learning systems at the level of training, validation and testing of datasets?
- What are the links and conflicts between modelling and simulating networks (simplifying reality), on the one hand, and creating a full 'digital twin' of networks, on the other hand, (an artefact, which, especially if endowed with AI, can become an actor of its own)?
- How can we validate simulation results? How do we ensure correspondence to reality?

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