

	FORMATO DE PRESENTACION DE PROPUESTA DE INVESTIGACIÓN Fondo concursable para financiación de proyectos de pequeña cuantía	Junio 2017
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PARTE I: INFORMACIÓN GENERAL DEL PROYECTO

Título del proyecto	Methodology and Social Epistemology in the Practice of Agent-Based Social Simulation, Part II	
Investigador principal	<i>Nombre completo y apellidos</i>	David Enrique Anzola Pinzón
	<i>Correo electrónico</i>	david.anzola@urosario.edu.co
	<i>Unidad académica a la que pertenece</i>	Escuela de Administración
Descriptores / palabras claves	Agent-based modelling, Social simulation, methodology, social epistemology	
Corto resumen del proyecto (máximo 300 palabras)	<p>This project is framed within the wider agenda of the Innovation Centre, and seeks to contribute to it from a methodological point of view. The Centre has adopted a theoretical-methodological framework under which innovation is understood as a complex phenomenon. Hence, its practices have been reoriented towards developing an account that tackles innovation problems at the organisational level with tools and theories associated with complexity, emergence theory and generative social science. The aims, mission and vision of the Innovation Centre now revolve around producing research and offering consultancy and teaching services using non-conventional computational tools and methods.</p> <p>The project, specifically, focuses on the development of sound methodological foundations for a method of particular interest to the Innovation Centre: agent-based modelling. The attractiveness of this method for the study of innovation derives from the fact that it allows to diachronically approach phenomena in which interaction among subcomponents is the key mechanism of change. In spite of its potential relevance to the practices of the Innovation Centre, agent-based modelling is yet to become mainstream in social science and its methodology is still underdeveloped. Seeking to provide foundations for a more robust use of agent-based modelling in the analysis of innovation, the project centres, first, on the methodological analysis of this distinctive form of computational simulation and, second, on the study of the social epistemology of computational social science, the disciplinary area articulated around the use of agent-based modelling in social science.</p>	
Duración del proyecto (en meses)	24	
Fecha esperada de inicio	Octubre 2018	
Fecha esperada de culminación	Octubre 2020	
Costo general del proyecto		
Costo a financiar por este fondo		
Contrapartida		

PARTE II: CONTENIDO DE LA PROPUESTA DE INVESTIGACIÓN

1. Planteamiento del problema y objeto de estudio

The Innovation Centre is an applied research unit that procures knowledge and organisational transformation through bio-inspired non-conventional computation. Following the example of companies such as *Concentric* and *Icosystem*, the Centre addresses issues about innovation on three fronts: research, software development and services. It accounts for stakeholders' interests in the academic, public and private sectors, although business organisations are the main target. The following project is framed within the first of these fronts. It seeks to strengthen the methodological tools informing both the research and services produced and offered by the Centre. The project focuses on a particular method: agent-based modelling. The reason is twofold. First, because of the relative novelty and increasing popularity of the method (Calder et al., 2018; Gilbert, 2003; Waldrop, 2018). Second, because of its potential for organisational research and applications (Fioretti, 2013; Wall, 2016).

Agent-based modelling is a research method with significant advantages over traditional qualitative and quantitative techniques (Gilbert, 2004). Initially, agent-based models are built using programming languages, which avoid the vagueness and ambiguity of natural language, as well as the stringent formalisation restrictions of mathematical languages (Epstein & Axtell, 1996; Gilbert, 2008). This feature of the method provides researchers with important syntactic and semantic flexibility during the modelling process. Additionally, agent-based modelling relies on a type of object-oriented programming that allows for ontological correspondence between the objects in the model and those in real life. The emphasis on computational entities is particularly useful for the analysis of phenomena where interaction is crucial, something typical of the social domain (Macy & Willer, 2002; Miller & Page, 2007). Finally, because of its reliance on computational infrastructure, agent-based modelling, first, permits large data processing in relatively short timespans, second, provides a diachronic representation of social phenomena and, third, offers means to avoid technical, economic and moral problems derived from direct interaction/experimentation with human subjects (Gilbert, 2008; Hartmann, 1996; Humphreys, 2004).

In spite of the prospective advantages of using agent-based modelling in social research, the adoption of the method in social science has been, to a certain extent, hampered by the lack of robust philosophical foundations (Anzola, 2015; Grüne-Yanoff & Weirich, 2010; Parker, 2013; Winsberg, 2010). The philosophy of simulation is a relatively new field of study and it has mostly focused on equation-based modelling in natural science. There are, however, some distinctive features of social phenomena that cannot be adequately captured unless the focus is explicitly on social simulation. The need is there, then, to develop a comprehensive framework that addresses the main philosophical issues associated with the use of agent-based models for social research. The distinctiveness of method, when applied in the social domain, should be understood methodologically, in terms, for example, of the technical and epistemological features of computational models and their connection to traditional concepts in social science (e.g., agency-structure) and philosophy of explanation (e.g., causality). It should also be studied in context, in terms of the individual (e.g., knowledge and skills) and structural (e.g., channels of communication) constraints of the practice of agent-based social simulation. This project centres on both.

Methodologically, the project focuses on the clarification of what it means to use computational models as objects of representation and experimentation. Given the historical dependence on computer science and software engineering, the explanatory approach of agent-based social simulation has overemphasised the technical and algorithmic features of computational models, pushing into the background concerns about what it means to use these models as an indirect source of knowledge that is manipulated in different ways by the researcher to produce knowledge claims (Anzola, 2015). Conversely, regarding social epistemology, the project tries to make explicit the tacit knowledge involved in modelling practices. Potential tensions and disagreements arising from differences in social epistemology are downplayed in everyday practices due to the decidedly practical orientation of the field (Anzola, 2018). These differences, however, need to be addressed, for they hinder standardisation and

risk eventually disrupting the ongoing process of disciplinarisation of agent-based computational social science.

2. Justificación

There is a twofold justification for the project. Initially, it could be argued, the project is necessary, given the Innovation Centre's agenda. As a research unit, we focus on 'innovation', a key concept in contemporary social, political and economic discourse, because of its alleged impact on the competitiveness and economic growth of both nations and organisations (Cantwell, 2006; Şener & Saridoğan, 2011; Zhang, 2013). Despite its popularity, it is suggested, the concept is not well articulated theoretically (Fagenberg, 2006; Godin, 2015). There is no clarity regarding the individual and social determinants of the innovation process. In turn, theorisation about these issues is often loose and fragmented. The Centre seeks to overcome this limitation by approaching innovation as a trasilient process of aggregation or structural reorganization of a system's components. The most distinctive feature of this approach is that it takes innovation as a complex emergent phenomenon. Working on the philosophical foundations of agent-based models helps legitimising the Innovations Centre's approach to innovation, for agent-based modelling is likely the most suitable method to model processes of emergence (Gómez-Cruz, 2018; Sayama, 2015). The more robust and generalised we can make our understanding of the method, the more likely it is that we can contribute in a proper manner to the overall conceptualisation of innovation.

The second reason for which the project is necessary is associated with the scientific status of the method and the disciplinary field revolving around it. In the upcoming years, agent-based modelling will probably become more prevalent in social science. Computational methods, in general, are becoming more common in the research landscape, given the constant developments in the technical capabilities of personal computer and the improvements in access and price of HPC and cloud computing. Agent-based modelling, in particular, has gained strength due to the increasing accumulation of suitable data and the practitioners' desire to get involved and impact new areas, such as policy-making (Calder et al., 2018; Gilbert, Ahrweiler, Barbrook-Johnson, Narasimhan, & Wilkinson, 2018). Finally, the popularity of the method could also be propelled by the growing dissatisfaction with the capabilities of traditional methods to deal with complex socio-technical and socio-ecological systems (Conte et al., 2012; Waldrop, 2018). It is likely that this popularisation will increase an ongoing disciplinarisation process that is grounded on three main tenets of disciplinarisation: self-recognition among practitioners, the belief that practices are novel or distinct, and some conditions of institutionalisation. Identifying aspects of social epistemology that significantly affect these processes can increase cohesion and consensus among practitioners and also improve the scientific status of agent-based modelling as a social research method.

3. Marco teórico y estado del arte

The literature on computational social science tackles some of the gaps in the philosophy of agent-based social simulation, particularly in what regards to methodology. Yet, many issues remain unaddressed. Most contemporary literature on the philosophy of agent-based social simulation comes from non-practitioners, with a general interest in computational simulation or experimentation, but without an in-depth knowledge of the method (e.g., Grüne-Yanoff & Weirich, 2010; Guala, 2002; Kuorikoski, 2011; Morgan, 2004). This literature provides some insights into how recent philosophical developments pertain to this type of modelling, but it only provides a partial and fragmented account. It has not led to the articulation of an agenda for the study of the philosophy of agent-based computational social science. This framework is necessary to understand, both descriptively and prescriptively, how different research practices emerge and propagate throughout the field. It is also required to judge on the general adequacy and effectiveness of these practices and their connection with the overall practice of social science.