Chapter 6.5
Policy Decision Support Through Social Simulation

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INTRODUCTION

Public policies are concerned with the definition of guidelines that promote the achievement of specific goals by a society/community of citizens. Citizens share a common geographic space under a set of political governance rules and, at the same time, are subject to common cultural influences. On the other hand, citizens have differentiated behaviours due to social, economical, and educational aspects as well as due to their individual personalities. Public interest relates with individual interests held in common—the result of joining the individual goals for the community. However, community goals may conflict with individuals' self-interests.

The outcome of public policies is emergent from this very complex set of rules and social and individual behaviours. Decision support in such a context is a hard endeavour that should be founded in comprehensive exploration of the set of available designs for the individual actors and the collective mechanisms of the society. Social simulation is a field that can be useful in such a complex problem, since it draws from heterogeneous rationality theory into sociology, economics, and politics, having computational tools as aid to perform analysis of the conjectures and hypotheses put forward, allowing the direct observation of the consequences of the design options made. Through social simulation it is possible to gain insights about the constraints and rules that effectively allow for the design

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and deployment of policies. The exploration of this set of possible models for individual actors, their relationships, and collective outcome of their individual actions is crucial for effective and efficient decision support.

Ever since the work of Simon (1955), it has been known that perfect rationality is not attainable in a useful and timely fashion. Social simulation provides an alternative approach to limited rationality, since it encompasses both observer and phenomenon in the experimentation cycle. Decision support systems can be enhanced with these exploratory components, which allow for the rehearsal of alternative scenarios, and to observe in silica the outcomes of different policy designs before deploying them in real settings.

BACKGROUND

The notion of agent and computational simulation are the master beams of the new complexity science (Conte et al, 1997; Kauffman, 2000). Computational simulation is methodologically appropriate when a social phenomenon is not directly accessible (Gilbert & Doran, 1994). One of the reasons for this inaccessibility is that the target phenomenon is so complex that the researcher cannot grasp its relevant elements. Simulation is based in a more observable phenomenon than the target one. Often the study of the model is as interesting as the study of the phenomenon itself, and the model becomes a legitimate object of research (Conte & Gilbert, 1995). There is a shift from the focus of research of natural societies (the behaviour of a society model can be observed "in vitro" to test the underlying theory) to the artificial societies themselves (study of possible societies). The questions to be answered cease to be "what happened?" and "what may have happened?" and become "what are the necessary conditions for a given result to be obtained?" and cease to have a purely descriptive character to acquire a prescriptive one. A new methodology can be synthesised and designated "exploratory simulation" (Conte & Gilbert, 1995). The prescriptive character (exploration) cannot be simplistically resumed to optimisation, such as the descriptive character is not a simple reproduction of the real social phenomena.

In social sciences, an appropriate methodology for computational simulation could be the one outlined by Nigel Gilbert (2000): (1) identify a "puzzle," a question whose answer is unknown; (2) definition of the target of modelling; (3) normally, some observations of the target are necessary to provide the parameters and initial conditions of the model; (4) after developing the model (probably in the form of a computer program), the simulation is executed and its results are registered; (5) verification assures the model is correctly developed; (6) validation ensures that the behaviour of the model corresponds to the behaviour of the target; and (7) finally, the sensitivity analysis tells how sensitive the model is to small changes in the parameters and initial conditions.

We are not far from the traditional computer science experimental methodology, but there are fundamental differences: in Gilbert's (2000) methodology there is a return to the original phenomenon, and not only to the specification. The emphasis is still on the system, and the confrontation of the model with reality is done once and for all, and represented by causal relations. All the validation is done at the level of the model and the journey back to reality is done already in generalisation. In some way, that difference is acceptable, since the object of the disciplines is also different.

But, is it possible to do better? Is the validation step in Gilbert's (2000) methodology a realist one? Or can we only compare models with other models and never with reality? If our computational model produces results that are adequate to what is known about the real phenomenon, can we say that our model is validated, or does that depend on the source of knowledge about that phenomenon? Is that knowledge not obtained

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