Agent-Based Modeling of Bureaucracies

Topic Identification

Bureaucracy is probably the most widely adopted administrative system in the contemporary world, whose importance has been highly recognized since Max Weber. Bureaucratic organizations are hierarchical systems comprised of different levels of specialized branches, to each of which is assigned responsibility for pursuing a limited number of goals falling within a single relatively narrow functional domain. The functionality of a bureaucratic system depends on the interactions of its highly heterogeneous components: individuals (or departments) differing in responsibilities, capacities, interests and access to resources and information. This has made ABM an important and general approach for organizational studies of bureaucracy. Personally, I am more interested in the power relationships between the divisions (and those between individuals), which is likely going to be the focus of my model.

Literature Review

Studies have revealed the relationship of power with decision making and information flows. Authority has been always associated with decisions, which are always to be made in bureaucracy, often by one or a few individuals in charge, who are generally considered to be in power. The authority of an individual is usually gauged by the extent to which s/he is able to make decisions.

However, the statement only refers to formal authority which, as is noted by Aghion and Tirole (1997), may differ from real authority. "If an agent with decision-making authority relies heavily on the information provided by other agents then the real authority (or power) may lie with those providing the information. The allocation of information and real authority are thus intertwined." (Chang & Harrington, 2006). Specifically, in Dessein (2002), lower-level agents may distort the information that they pass along to higher levels.

Approach

Without finding existing models appropriate for my purpose so far, I will probably have to design the model from scratch. (Though Chang and Harrington (2006) do present a variety of agent-based models for organizational studies, they are concerned more with organization performances in problem solving.)

It would be preferred here to take individual bureaucrats as the agents in our model. When necessary, multilevel ABMs might be used, where component systems (which are themselves bureaucratic systems comprised of individual bureaucrats) are also viewed as agents. Given the studies above, we will be modeling a system of decision making and information flows, where there are flows of exogenous information, proposals and performance reports upwards, as well as decisions about resource rearrangement, task assignments, replies to proposals (approvals,

disapprovals or modifications) and even personnel changes downwards. Here, decisions can be made by either a single senior agent or several senior agents collectively. All these are based on a formal tree structure of the organization; however, formal and informal communication links can also be added to complicate the model, which can make it possible for sibling agents to cooperate in their tasks (or even to contrive against their parent agent), or for the root agent to directly supervise the terminals, etc.

In such a model, while serving as exterior sources of information accessible to different terminal agents, the environment also conditions the performance of different tasks of different agents. The setting of environment might influence the strategies of the agents and thus the allocation of power in the system.

As far as I am concerned, the model can be studied under two different time scales. Under a shorter time scale, we might well ignore personnel changes, and focus on the extent to which inferior agents are able to manipulate the replies to their proposals (or their performance evaluations by senior agents) by deliberate information operations. Under a longer one, however, it might be interesting to observe any pattern of personnel changes.

Reference

Aghion, P., & Tirole, J. (1997). Formal and real authority in organizations. *Journal of political economy*, 105(1), 1-29.

Chang, M. H., Harrington Jr, J. E. (2006). Agent-based models of organizations. *Handbook of computational economics*, 2, 1273-1337.

Dessein, W. (2002). Authority and communication in organizations. *The Review of Economic Studies*, 69(4), 811-838.