Chapter 10

Policy Designing via System Dynamics

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ABSTRACT

This chapter aims to explain system dynamics approach. System dynamics approach was developed by Jay Forrester from MIT during the 1950s to analyze especially the complex behavior in administration with computer simulation in social sciences. System dynamics is a form of systems approach as a methodology to understand the dynamic behavior of complex systems. The basis of system dynamics is to understand how system structures cause system behavior and system events. System dynamics deals with how things change over time. Almost all are interested in how the past formed the present moment and how today’s actions determine the future.
INTRODUCTION

Tools for learning about complexity must also facilitate the process of systems thinking and policy design. While the virtual world enables controlled experimentation, it does not require us to apply the principles of scientific method. Similarly, defensive routines and groupthink that thwart learning in teams can operate in the learning laboratory just as in the real organization. Effective modeling often requires members of the client team to recognize the limitations of their inquiry skills and address their own defensive behaviors. Managers unaccustomed to disciplined scientific reasoning and an open, trusting environment with learning as its goal will have to build these basic skills before a system dynamics model—or indeed, any model—can prove useful. Developing these skills takes effort and practice.16 The list of successful interventions using system dynamics is growing. Of course there are also failures, as the community of modelers continues to learn and improve the tools and process. Recent successful projects in the business world include strategy design for a highly successful wireless communications startup, leasing strategy for a large automaker, supply chain reengineering in a number of major high-technology firms, a new marketing strategy for a major credit card organization, long-range market forecasts and strategy development for a major commercial aircraft manufacturer, clinical trial and marketing strategies for new pharmaceuticals, models for effective management of large-scale projects in software, civil construction, shipbuilding, aerospace, defense, and commercial product development—and many others(Sterman, 2001: 22).

Jay Forrester initially constructed his first dynamic model upon his meeting with the management of General Electric corporation. Big fluctuations in production, inventory, labor force and profitability were compelling GE management. Despite hard efforts of the management, these fluctuations were mostly associated with external factors. Especially, the fluctuations in the business were related to received orders. Forrester interacted with the management to observe the system operations in other departments. In the first model he developed, he observed that simulations were necessary since the system could not be monitored analytically. He demonstrated that the corporation could experience serious fluctuations due to management policies even when the demand is considered constant with the weekly simulation he ran. Later on, he designed the computer simulation for the same problem. In his later studies, Forrester demonstrated how the feedback control theory could be adapted for complex administration and human systems. He published his initial findings in an article in Harvard Business Review. Later on, he developed this study to write his famous work “Industrial Dynamics” (Lane and Sterman, 2011; Ramage and Shipp, 2009: 100-101).
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