



ITS 832

Chapter 4

Policy Making and Modelling in a Complex World

Information Technology in a Global Economy

Professor Michael Solomon

UNIVERSITY *of the*
CUMBERLANDS

Introduction

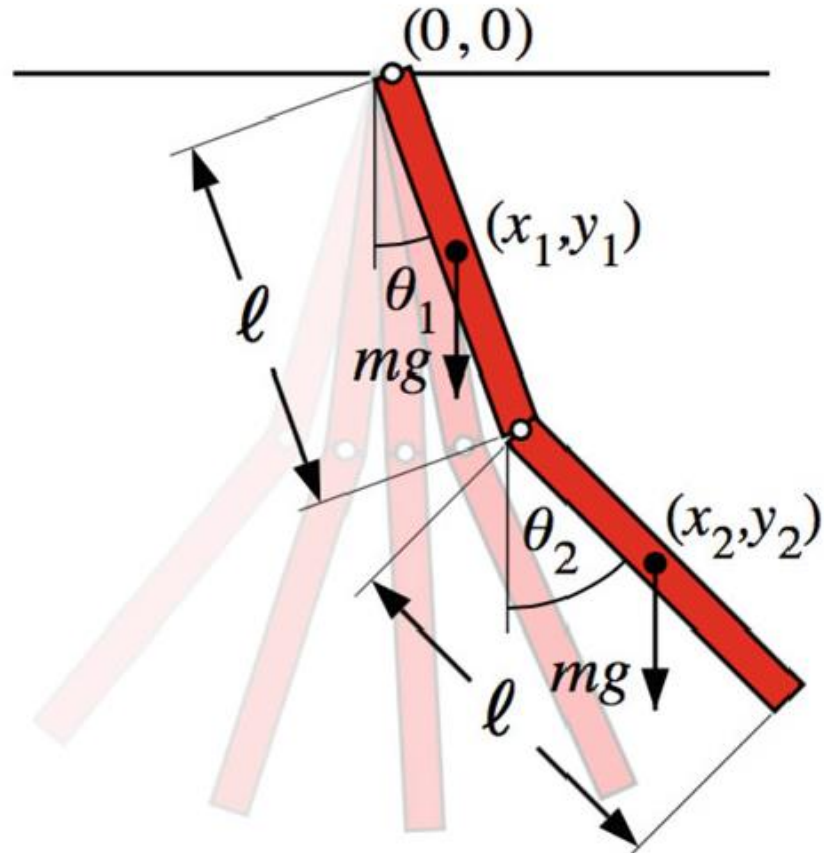
- Policy Making and Modelling in a Complex World
- Complexity
- Managing Complex Systems
- Modelling for Complex Systems

Complexity

- System composed of multiple interacting elements
 - Possible behavioral states can combine in ways that are hard to predict
- Many complex systems in the physical world
- Adaptive capacity of organisms allow for long-term survival in complex systems
 - Complex Adaptive Systems (CAS)

Double Pendulum Example

Fig. 4.1 Double pendulum.
(Source: Wikipedia)



Common Mistakes in Managing Complex Systems

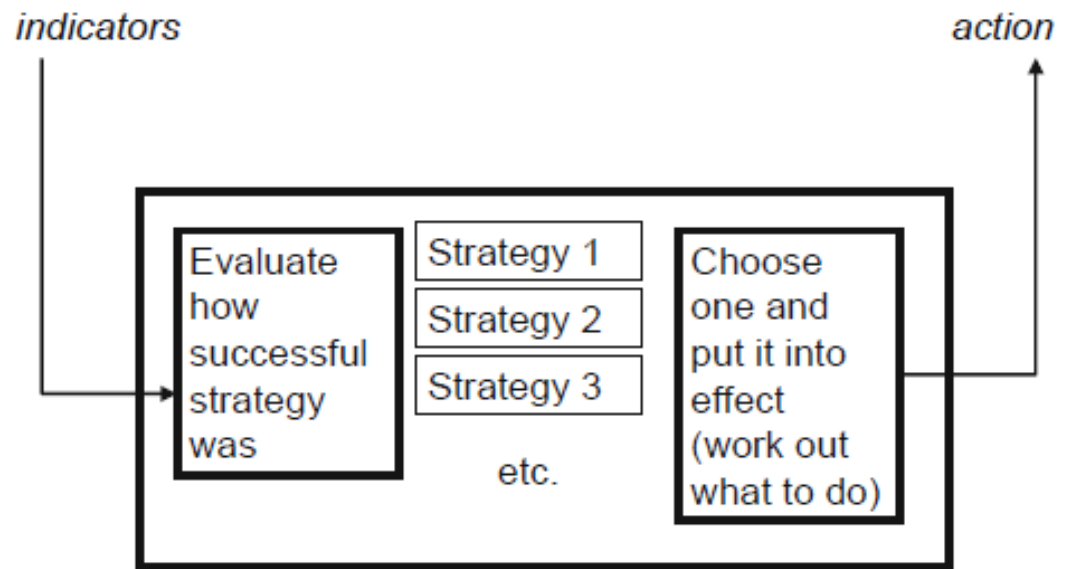
- Quantification
 - Policy is biased towards easily quantifiable features
 - Most often, monetary quantification
 - Commonly overlooks important non-quantifiable aspects
- Compartmentalization
 - Attempts to simplify complex social systems
 - Large systems are split into smaller systems
 - Likely to miss interactions between smaller systems
 - Spillover effect

Complexity in Policy Making

- Common approaches
 - Instrumental
 - Choosing between a set of possible policies
 - Evaluated based on past effectiveness
 - Requires
 - Large enough pool of available strategies
 - Effective assessment if effectiveness
 - Representational
 - Series of models
 - Each is assessed on its ability to predict observed behavior

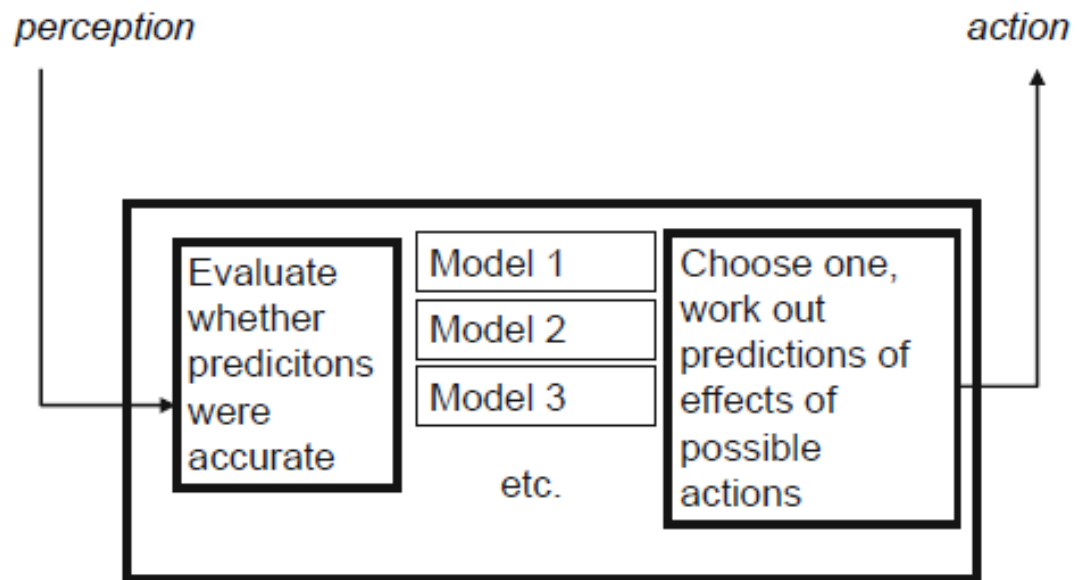
Instrumental Approach

Fig. 4.3 An illustration of the instrumental approach



Representational Approach

Fig. 4.4 An illustration of the representational approach



Agent-based Models

- Represents individuals as separate models
- Agents interact through a network
- Distributed nature allows for realistic interactions
- SIMSOC
 - Simulated Society
 - Modeling projects repository

Summary

- Complex systems are difficult to model
- Interactions can be unpredictable
- Common mistakes in modeling complex systems
 - Quantification
 - Compartmentalization
- Two common approaches to complex system modeling
 - Instrumental
 - Representational
- Agent-based modeling